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Intel 8-Core
Media Creation PC

Asus M2N32-SLI
Vista Edition

MSI
K9AGM2-FIH

CPU®
COMPUTER POWER USER

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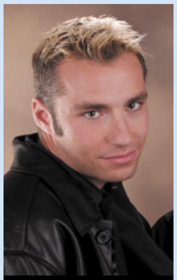

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EDITOR'S NOTE

I'm a big fan of copyright laws. Of course, as the employee of a publishing company, I have a vested interest in the protection of my company's intellectual property. But I'm also a believer in capitalism in general, and as such I recognize the importance of protecting the value of certain kinds of work that might otherwise be marginalized.

Having said all that, I must confess I'm more than a little concerned at the current state of consumers' rights with regard to copyright laws and fair use. The erosion of fair use rights began in earnest with the 1998 DMCA (Digital Millennium Copyright Act), which among other things criminalized circumventing DRM technology, even for the purpose of making personal-use copies of content distributed through digital means. So, although it has been legal for many years to copy purchased music and movies for one's personal use—and still is—it is now illegal to break the encryption that, for example, is designed to prevent the copying of DVDs.

In essence, special interest groups (most notably the Motion Picture Association of America and the Recording Industry Association of America) did an end-run around consumers' rights by influencing federal legislation, and unfortunately they are working to do it again. That's right, the same folks who told Congress the VCR would ruin the movie industry still aren't happy with your level of autonomy when it comes to using their products, so now they're working with the U.S. Attorney General and pushing Congress to ratify the newly inked Intellectual Property Protection Act of 2007. In addition to making intent to infringe on copyrights a crime for the first time, the Act includes provisions for easier wiretaps and seizures and requires the Department of Homeland Security to notify RIAA in the event that someone tries to import bootleg CDs.

Again, I'm all for the protection of intellectual property, but do you really want Homeland Security agents spending their time tracking down crates of phony Fergie CDs? The good news is this is the latest in a series of attempts to pass such legislation since 2004, and it hasn't been successful yet. But don't just assume things will work out in Washington; Google "Intellectual Property Protection Act of 2007," check out the DOJ's proposal, and let your representatives know what you think.

Chris Trumble, Publication Editor, *CPU*

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Gotcha.
Here it is.

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EPP Enhanced Performance Profiles

Cool Performance

HOW CORSAIR MAINTAINS
TECHNOLOGY LEADERSHIP

CORSAIR™

INNOVATION

PERFORMANCE

RELIABILITY

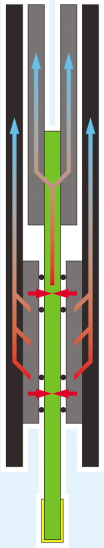
Here's the latest in Corsair's ten year heritage of innovation in performance memory: we've redefined memory heat sink technology. And the result is unprecedented performance and reliability. When we ran a preview module through system benchmarks at COMPUTEX, an overclocked DHX module with our optional airflow fan was able to hit a heart-stopping 1250MHz (PC-10,000) while maintaining cool, reliable performance.

Protect Components While You Push Performance

Pushing performance specs generates heat, and that can compromise reliability and component life. The advanced cooling ability of DHX heat sinks keeps your memory safe and reliable even as you push it to the limit. Under the name XMS2 Dominator, this DHX technology will be showing up on both Corsair parts designed for extreme overclocking and on memory designed for performance computing and gaming.

Also Featuring Enhanced Performance Profiles (EPP)

As with all new Corsair performance memory, XMS2 Dominator modules feature EPP, the new open standard for the Serial Presence Detect (SPD) jointly developed by NVIDIA and Corsair. EPP simplifies overclocking for beginners and provides unparalleled control for experts.



AIRFLOW

An optional fan (not shown) provides even more cooling and protection.

DHX DUAL-PATH HEAT XCHANGE

Corsair's proprietary DHX technology dissipates heat two ways: it draws heat away from the module through the RAMs and provides an additional path for heat transfer within the module through the ground plane!

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Compiled by Blaine Flamig

Creative

Throws Stones At Music Buyers

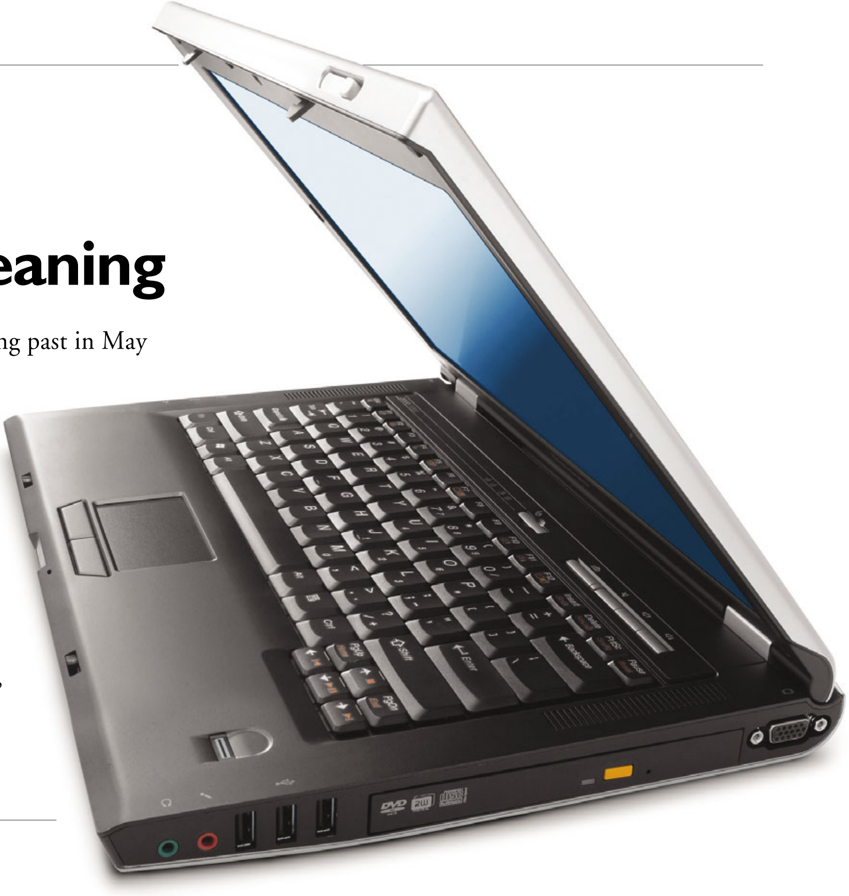
Even if you skipped Creative's new 1GB Zen Stone across a pond, at just $39.99 (half the price of an iPod shuffle), it's priced so sweetly you could afford to replace it without much trouble. The screenless, plug-and-play Stone comes in black, white, pink, blue, red, and yellow; supports Audible files; and includes a nice Skip Folder option to navigate groups of songs. The rechargeable, built-in Li-Ion polymer battery offers 10 hours of life, while the Stone holds up to 500 WMA tracks at 64Kbps or 250 MP3s at 128Kbps. Creative has already announced a portable Travel-Sound Zen Stone docking speaker system ($69) that runs on two AAA batteries. ▲

The Lazy Man's Personalized Portable Radio

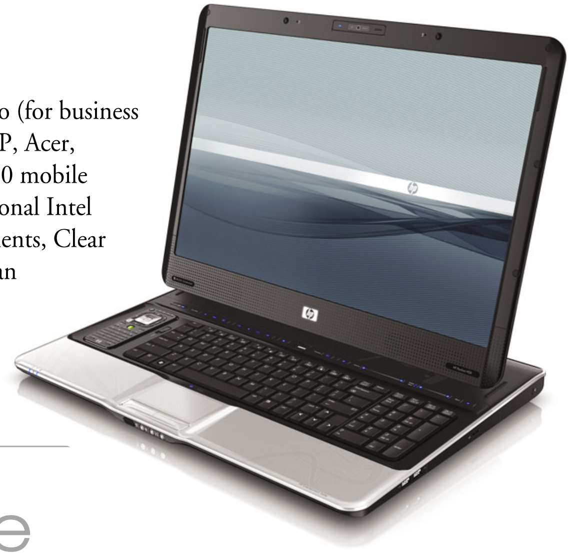
Where free Internet radio goes, Slacker's 100 or so customizable free stations are as good as we've come across. Even better is that Slacker should have 2GB ($150) and 12GB ($400) players now available to take those tunes with you and continually refresh them via Wi-Fi and satellite connections. Slacker—headed by Dennis Mudd, Jonathan Sasse, and Jim Cady, formers heads of MusicMatch, iRiver, and Rio, respectively—already has licensing rights with Sony BMG Entertainment, Universal Music Group, and scores of indie labels. For $7.50 per month, you can axe banner ads and keep songs as long as you like. "Most MP3 players are too much work for the average user. They don't want to bother updating their players via a USB connection. Our devices will just feed themselves," Sasse stated. ▲

Big Blue's Spring Cleaning

IBM continued to distance itself from its notebook-selling past in May when it sold 223 million shares of Lenovo stock, about a third of its holdings in Lenovo. In February, IBM sold 300 million shares of Lenovo stock, raising about $123 million. Earlier in May, IBM laid off about 1,300 employees as part of a cost-cutting effort in U.S. operations. PBS.org blogger Robert Cringely later posted that IBM was planning to cut upward of 150,000 employees by year's end as part of LEAN, an offshore/outsourcing project. Cringely's post was met with severe skepticism by analysts, who called the predictions "ludicrous," "hogwash," and nonsensical considering the total essentially equals IBM's entire U.S. operations. ▲



Santa Rosa Sparks Mass Releases



With Intel's mid-May release of the Centrino Duo (for consumers) and Centrino Pro (for business users) platforms, consumers are knee-deep in new and future mobile devices from HP, Acer, Gateway, Dell, Lenovo, Toshiba, etc. At press time, Intel already cited more than 230 mobile designs from manufacturers in the works. The latest flavor of Centrino includes optional Intel Turbo Memory (integrated flash NAND RAM) for battery-life and speed improvements, Clear Video Technology for HD content, Intel TV Wizard, draft-n wireless support, and an 800MHz FSB for faster Core 2 Duos. Near press time, HP had already announced 13 new notebooks, Fujitsu four new LifeBooks, Toshiba two new Tecras, and Lenovo two new ThinkPads. ▲

Hardware Mole

Not-So-Cool News For Hard Drives

What better way to battle July's omnipresent waves of unbearable heat than pumping a steady blast of chilled air from the air conditioner, right? Wrong, at least where the health of your hard drives is concerned. According to Ben Carmitchel, ESS Data Recovery president, his company sees a 20% increase in failed hard drives during summer months as opposed to winter months, plus far more electrical-related issues. After surveying various customers, Carmitchel says power surges from air conditioners, which can raise electrical use in homes by 50%, are one culprit. Throw in the threat of unexpected thunderstorms, and a few inches of snow doesn't sound so bad after all. ▲

$250 HD DVD Players At Wal-Mart?

Would-be HD DVD player owners had their movie-watching dreams squashed in late April when reports that Wal-Mart had ordered 2 million players from Taiwanese manufacture Fuh Yuan priced between $250 and $299 proved inaccurate. Reports in early May had Fuh Yuan partnering with TDK to make the players, but a Wal-Mart spokesman stated soon after, "Most of the facts, including the purchase, were untrue." Fuh Yuan later posted on its site, "The actuality is that we had not received [an order] yet. We are asked to provide the schedule to Wal-Mart and cost to determine the quantity even more than two million, if the cost is good enough and timing is correct. So the capacity is under consideration." A Wal-Mart spokesman declined comment on Fuh Yuan's anticipatory-laden statement. ▲

USB Flash Drives Get Silly

Finding a vulnerable spot to attack is a trait all good predators share, including hackers. According to Sophos, soft-spot hackers are now sinking their teeth into USB flash drives via the W32/SillyFD-AA worm family. Silly attacks by creating a hidden file that runs when an infected drive is connected to a Windows rig. Beyond checking drives for viruses and malware, Sophos recommends disabling Windows' Autorun function. Meanwhile, according to a recent poll of 370 IT pros, 38.4% say removable storage devices are a top security concern due to their portability and the ease in which employees can download data and take it offsite. Additionally, 80% said their companies don't have effective policies in place to battle unauthorized portable device use, 42.2% claimed no control at all, and 8.5% reported bans on portable storage devices. ▲

Comcast Broadband Modem Burns Rubber

Comcast's CEO Brian Roberts gave us a glimpse of our online future in mid-May during a demonstration of a new cable modem offering up to 150Mbps bandwidth based on the DOCSIS 3.0 standard. If you're keeping track at home, that's reportedly 25 times the rate of today's modems. Cool your jets, though; Comcast, which is battling Verizon Online and its FIOS fiber-optic service for customers, reportedly won't release the modems for two years or so. Still, during the demonstration, Roberts downloaded the 32-volume *Encyclopedia Britannica 2007* and *Merriam-Webster Visual Dictionary* in less than four minutes. "The same download on dial-up would have taken two weeks," Roberts stated. ▲

What's Happening • Chip Watch

Compiled by Dean Takahashi

Samsung Launches 16-Gigabit Flash Memory Chips

Your next iPod nano is going to have a huge amount of storage thanks to the latest advances in flash memory. Samsung Electronics has begun mass production of its 16Gb NAND flash, the highest-capacity memory chips now available for permanent storage in devices such as the iPod nano. The company is fabricating the chips in factories that can create circuits with 51-nanometer widths. Previously, Samsung's most advanced chip was an 8-gigabit NAND flash chip fabricated with a 60-nanometer process. The South Korean electronics firm started making those chips in August 2006. If consumer electronics companies put eight of the 16Gb chips on a board, they will be able to hold 4,000 MP3 songs, or 10 DVD movies or 100 years of a newspaper. ▲

The 51-nanometer NAND Flash chips can store 4,000 songs on a single chip

University Of Missouri At Columbia Wins $10 Million Nanotech Research Grant From Department of Defense

The University of Missouri at Columbia has won a $10 million contract from the Department of Defense to develop nanotechnology solutions that produce alternative energy and also detect biological weapons. The school's college of engineering will partner with the military's Picatinny Arsenal in New Jersey to make nanotech devices that employ microscopic particles the size of atoms. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Athlon 64 X2 Dual-Core 4600+ AM2 only	5/31/2005	$803**	$118	$115
AMD Athlon 64 X2 Dual-Core 4800+ energy efficient	5/16/2006	$671**	$189	$189
AMD Athlon 64 X2 Dual-Core 4800+	5/31/2005	$1,001**	$129	$189
AMD Athlon 64 X2 Dual-Core 5000+ AM2 only	5/23/2006	$696**	$189	$204
AMD Athlon 64 X2 Dual-Core 5200+ AM2 only	9/6/2006	$827**	$192	$200
AMD Athlon 64 X2 Dual-Core 5400+ AM2 only	12/12/2006	$485**	$179	$275
AMD Athlon 64 X2 Dual-Core 5600+ AM2 only	12/12/2006	$505**	$228	$299
AMD Athlon 64 X2 Dual-Core 6000+ AM2 only	2/20/2007	$464**	$262	$379
AMD Athlon 64 FX-62	5/23/2006	$1,031**	$319	$369
AMD Athlon 64 FX-70	11/30/2006	$599/pair	$321/pair	$320/pair
AMD Athlon 64 FX-72	11/30/2006	$799/pair	$304/pair	$375/pair
AMD Athlon 64 FX-74	11/30/2006	$999/pair	$424/pair	$532/pair
Intel Pentium 4 660 3.6GHz 2MB cache 800MHz FSB 90nm	2/21/2005	$605**	$325	$325
Intel Pentium 4 661 3.6GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$401**	$149	$149
Intel Pentium 4 670 3.8GHz 2MB cache 800MHz FSB 90nm	5/26/2005	$849**	$668	$641
Intel Pentium D 840 3.2GHz dual-core 2MB cache 800MHz FSB 90nm	5/26/2005	$530**	$574	$574
Intel Pentium D 920 2.8GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$241**	$92	$98
Intel Pentium D 930 3GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$316**	$135	$124
Intel Pentium D 940 3.2GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$423**	$149	$139
Intel Pentium D 950 3.4GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$637**	$249	$248
Intel Pentium D 960 3.6GHz dual-core 2MB 800MHz FSB 65nm	5/1/2006	$530**	$348	$341
Intel Core 2 Duo E6300 1.86GHz 2MB cache 1,066MHz FSB 65nm	7/27/2006	$183**	$166	$180
Intel Core 2 Duo E6400 2.13GHz 2MB cache 1,066MHz FSB 65nm	7/27/2006	$224**	$180	$217
Intel Core 2 Duo E6600 2.4GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$316**	$224	$306
Intel Core 2 Duo E6700 2.66GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$530**	$318	$507
Intel Core 2 Duo X6800 2.93GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$999**	$910	$910
Intel Core 2 Quad Q6600	1/8/2007	$851**	$529	$789
Intel Core 2 Extreme QX6700	11/14/2006	$999*	$949	$899

New Wireless Tags Operate For 10 Years & Are Much Smaller Than RFID Tags

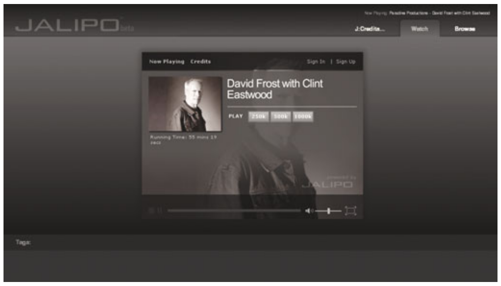
RuBee Tags Maker Scores Investment From Epson Electronics America For Tiny Tracking Tags

Wait, is that an ant or a sensor? Get ready for the age of really, really small electronic tags, as Miami-based Visible Assets prepares to launch its wireless RuBee technology. The company said that Epson Electronics America has made a strategic investment in Visible Assets to help pioneer RuBee, which is a low-frequency visibility network protocol. RuBee tags can be made as thin as 1.5 millimeters, operate for 10 years on a coin-sized Lithium Ion battery, and work in underwater and underground environments where RFID (radio frequency identification) tags don't work. RuBee works with both active and passive radio tags that have no battery with a range of 1 to 100 feet. The tags have an integrated clock to enable security and privacy. The RuBee technology is supported by the pending IEEE P1902.1 engineering standard. ▲

Compiled by Blaine Flamig

"The First Online Marketplace For TV & Video"

Maybe Jalipo's (www.jalipo.com) founders had grown as tired of YouTube-related lawsuits concerning unlicensed content as we have when they created their still-in-beta service, which offers live TV and on-demand video in a pay-per-minute model. Jalipo also gives content owners a vehicle to sell and syndicate their programming, which they can price and restrict based on territory. "This is absolutely not for user-generated content," CEO Alex Taylor stated. "If you were looking to put us into the marketplace, I would put us at the other end of the market to YouTube." Jalipo offers 100 free J:Credits to sample the content, including BBC World, Al Jazeera, Bloomberg TV, and EuroNews TV stations, as well as other still-sparsely-populated categories. ▲

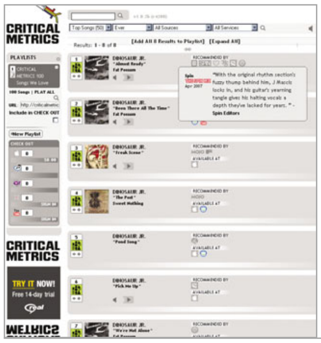


Flashy Flash Drives

Just when we thought we'd seen all conceivable concoctions of USB flash drives, CustomUSB.com proves us wrong. The site not only sells more than 75 drive styles—including wooden, leather, plastic, and rubber drives in pear-shaped, round, triangular, and wallet form factors with laser pointers, cameras, pens, calculators, and more built in—it will dress your drive up with color imprinting, laser engraving, hot stamping, and LEDs. Further, you can use a Virtual Logo Lab to stick a personal or company logo on your drive's exterior. MP3 players, Web cams, external hard drives, mice, and other USB devices are also available. ▲

A Really Good Beat You Can Dance To

Back in the day, Dick Clark hipped us to new music by letting two "American Bandstand" dancers rate two new records each week. Today, we have Critical Metrics (www.criticalmetrics.com). The site scours dozens of music-centric blogs (Gorilla vs. Bear, Music For Robots), online music sources (Pitchfork, Yahoo! Music, Rhapsody), and magazines and newspapers (*Rolling Stone*, *Spin*, *Blender*, *MOJO*) to extract the best-reviewed new music. Critical Metrics lets you listen to tracks free, link to sellers, and read the exact comments that got the songs noticed to begin with. The site makes all this available in a visually-packed, ad-free interface that's stuffed with enough audio goodness to keep audiophiles giddy for weeks to come. ▲



Site Seeing

Saving The World One Deal At A Time

CPU readers like a good bargain. How do we know? We read your comments about our Daily Deal at CPUmag.com. In that light we bring you Froomb.com, a self-described comprehensive Deal-Of-The-Day Directory of sites selling new, used, and refurbished goods, including everything from digital cameras to garden supplies to wine products to a daily bargain on Mac software. Far-reaching the site is. Since discovering Froomb.com, we've found at least one item each day that's forced us to fight the urge to whip out our wallet and start spending. ▲

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Saving the world. One deal at a time.
Deal-of-the-Day Directory
Google
Search

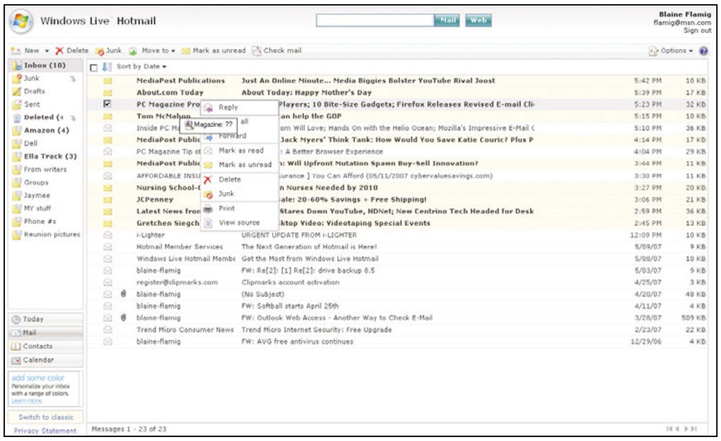
100 Sites Worth Of Free Movies

Sure, the Web is full of more junk than Fred Sanford could have shaken his faux stroke-riddled arm at. Dig deep enough, though, and you'll find treasure, including the "100 Reviewed Places To Watch Free Movies Online" post from inspiring filmmaker Solomon Rothman (www.solomonrothman.com/blog). Rather than just compile a list, however, Rothman categorized the sites by content (Video Blogging, Torrents, Movie, and TV Portals), using information he considers "most valuable to humans" as a barometer. Rothman also offers up good site summaries/reviews, pointing RSS, podcast, and other options available, as well as pop-ups, required registrations, and illegal content you may run into. ▲

What's Happening • Software

Compiled by Blaine Flamig

Hotmail Takes Its Act Live



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Hotmail Member Services	The Next Generation of Hotmail is Here!	5/09/07	9 KB
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blaine-flamig	FW: Re[2]: [1] Re[2]: drive backup 8.5	5/03/07	9 KB
register@clipmarks.com	Clipmarks account activation	4/25/07	3 KB
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Trend Micro Consumer News	Trend Micro Internet Security: Free Upgrade	2/23/07	22 KB
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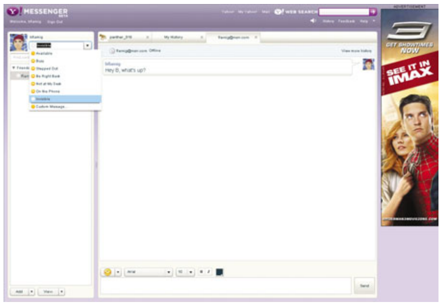
Microsoft sought the input from more than 20 million beta testers before launching Windows Live Hotmail in mid-May. By the looks of the MSN Hotmail successor, the input was worthwhile. Live Hotmail sports multiple reading pane options; drag-and-drop ability; right-click context menus; color-coded security visuals; 36 supported languages; 2GB storage; folder filtering options; keyboard shortcuts; and, of course, integration with other Windows Live services. Additionally, a mobile tool lets you access email from Web-enabled phones and PDAs. Microsoft was also expected to release Outlook Connector later in May to let users view/sync Live Hotmail data from Outlook, plus offer Windows Live Mail beta, a free, downloadable client anointed as the successor to Outlook Express and Windows Mail on Vista. ▲

Yahoo! Messenger Doesn't Need A Stinkin' Download



IM fanatics now have a new Web-based tool to rely on when they're away from their main PC in the form of Yahoo! Messenger for the Web, which Yahoo! describes as a "lite" version of the application's full version. Built on Adobe's Flash, no download is necessary to carry out basic IMing functions, although "lite" does mean no support for conferencing, transferring files, sharing images, Voice, LAUNCHcast Radio, IMviron-ments, Web cams, or plug-ins. Still, Messenger's Web-based extension does offer conversation tabs, as well as the ability to save conversations on Yahoo!'s servers—meaning those you converse with can also save what you type, so take heed. ▲

Really, You Should Talk To Your Harmony

What could possibly make Logitech's Harmony 1000 universal remote any sweeter? How about integrated IBM ViaVoice voice-recognition software ("fast-forward"), voice-enabled search abilities ("play Metallica"), biometric security features (think fingerprint recognition for loading user preferences and blocking kids from watching adult content), and possibly built-in Wi-Fi support? Bryan McLeod, VP of Logitech's Harmony business unit, offered up such hope during a recent panel discussion at the Connections trade show. McLeod, who stated Logitech is already working on such developments in a prototype, added, "We're currently only looking at it on our most powerful platform, the Harmony 1000, which has a touch-screen remote control. It works pretty well; it's pretty interesting." ▲

Ubuntu

Sees The Mobile Light

Shortly before press time, Ubuntu announced plans to port its open-source OS to Internet-enabled mobile devices, including tablets. Ubuntu is relying on volunteer developers and users to pitch in, as well as Intel, which will lend "significant contributions of technology, people, and expertise," according to Matt Zimmerman, Ubuntu's CTO. Zimmerman stated, "It is clear that new types of devices—small, hand-held, graphical tablets which are Internet-enabled—are going to change the way we communicate and collaborate. In re-sponse to the technical challenges that these devices pose, we are announcing the Ubuntu Mobile and Embedded Project." Expect version 7.10 of the OS in October. In related news, Dell plans to offer new desktops running Ubuntu's OS, although Ubuntu purposely won't include the WINE emulator. "Linux has its own strengths, and users should want it because of those strengths and not because it's a cheap copy of Windows," Ubuntu chief Mark Shuttleworth stated. ▲

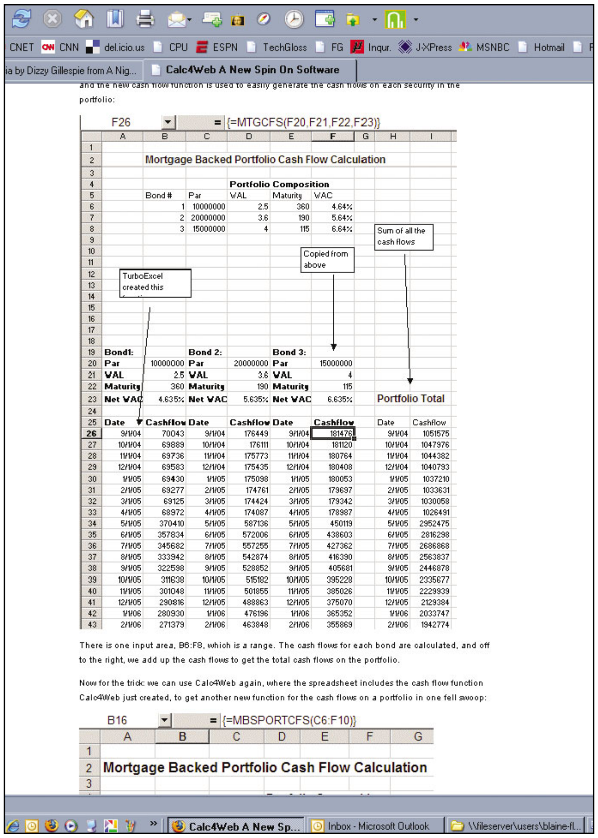
Software Shorts

Gaim Becomes A Pidgin

Following a name change in April from Gaim to Pidgin (apparently "Gaim" was a little too close to "AIM" for AOL's liking), the company has released the highly-anticipated 2.0 version of the multi-protocol-supporting app (AIM, Yahoo! Messenger, MSN Messenger, IRC, ICQ, Google Talk, etc.) that lets you log in to numerous accounts on numerous IM networks at once. With the free 2.0 release of the open-source app, Pidgin's improved interface really does make the program easier to use. Pidgin 2.0 also includes a new system for managing accounts, a revised status system, and more. Unfortunately, voice and video chat support are still missing. ▲

TurboExcel Gets A Name Change Thanks To Microsoft

As further proof that it's wise to line up your allies before taking on a much bigger opponent, SavvySoft, maker of a spreadsheet application originally labeled TurboExcel, recently walked away from a three-year battle with Microsoft over the application's name. The companies reportedly agreed on an undisclosed settlement concerning the fight, which first got MS' ire up in 2004 when it warned SavvySoft that "TurboExcel" was too similar to "Excel," thus infringing on MS' trademark name. SavvySoft countered that MS hadn't registered Excel as a trademark at TurboExcel's launch. Still, Rich Tanenbaum, SavvySoft CEO, conceded in May that his company couldn't find a backer to help fight MS in court, and "we kind of knew we were going to have to change the name." The new handle SavvySoft settled on? Calc4Web. ▲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CNN
del.icio.us
CPU
ESPN
TechGloss
FG
Inqur.
J-XPress
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Hotmail
ia by Dizzy Gillespie from A Nig...
Calc4Web A New Spin On Software
TurboExcel created this
Copied from above
Sum of all the cash flows
Calc4Web A New Sp...
Inbox - Microsoft Outlook
\\fileserver\users\blaine-fl...

and the new cash flow function is used to easily generate the cash flows on each security in the portfolio:

F26 = {=MTGCFS(F20,F21,F22,F23)}

	A	B	C	D	E	F	G	H	I
1									
2		Mortgage Backed Portfolio Cash Flow Calculation							
3									
4				Portfolio Composition					
5		Bond #	Par	WAL	Maturity	WAC			
6		1	10000000	2.5	360	4.64%			
7		2	20000000	3.6	190	5.64%			
8		3	15000000	4	115	6.64%			
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19	Bond1:		Bond 2:		Bond 3:				
20	Par	10000000	Par	20000000	Par	15000000			
21	VAL	2.5	VAL	3.6	VAL	4			
22	Maturity	360	Maturity	190	Maturity	115			
23	Net VAC	4.635%	Net VAC	5.635%	Net VAC	6.635%		Portfolio Total	
24									
25	Date	Cashflow	Date	Cashflow	Date	Cashflow		Date	Cashflow
26	9/1/04	70043	9/1/04	176449	9/1/04	181476		9/1/04	1051575
27	10/1/04	69889	10/1/04	176111	10/1/04	181120		10/1/04	1047976
28	11/1/04	69736	11/1/04	175773	11/1/04	180764		11/1/04	1044382
29	12/1/04	69583	12/1/04	175435	12/1/04	180408		12/1/04	1040793
30	1/1/05	69430	1/1/05	175098	1/1/05	180053		1/1/05	1037210
31	2/1/05	69277	2/1/05	174761	2/1/05	179697		2/1/05	1033631
32	3/1/05	69125	3/1/05	174424	3/1/05	179342		3/1/05	1030058
33	4/1/05	68972	4/1/05	174087	4/1/05	178987		4/1/05	1026491
34	5/1/05	370410	5/1/05	587136	5/1/05	450119		5/1/05	2952475
35	6/1/05	357834	6/1/05	572006	6/1/05	438603		6/1/05	2816298
36	7/1/05	345682	7/1/05	557255	7/1/05	427362		7/1/05	2686868
37	8/1/05	333942	8/1/05	542874	8/1/05	416390		8/1/05	2563837
38	9/1/05	322598	9/1/05	528852	9/1/05	405681		9/1/05	2446878
39	10/1/05	311638	10/1/05	515182	10/1/05	395228		10/1/05	2335677
40	11/1/05	301048	11/1/05	501855	11/1/05	385026		11/1/05	2229939
41	12/1/05	290816	12/1/05	488863	12/1/05	375070		12/1/05	2129384
42	1/1/06	280930	1/1/06	476196	1/1/06	365352		1/1/06	2033747
43	2/1/06	271379	2/1/06	463848	2/1/06	355869		2/1/06	1942774

There is one input area, B6:F8, which is a range. The cash flows for each bond are calculated, and off to the right, we add up the cash flows to get the total cash flows on the portfolio.

Now for the trick: we can use Calc4Web again, where the spreadsheet includes the cash flow function Calc4Web just created, to get another new function for the cash flows on a portfolio in one fell swoop:

B16 = {=MBSPORTCFS(C6:F10)}

	A	B	C	D	E	F	G
1							
2	Mortgage Backed Portfolio Cash Flow Calculation						
3							

BIOS Upgrades Available Online

Compiled by Steve Smith

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpujul07/bios to see our entire upgrade list.

Motherboard	Date Available	URL
ASRock ALiveNF5-eSATA2+	5/2/2007	ftp://download.asrock.com/bios/AM2/ALiveNF5-eSATA2+(1.30).zip
ASUS F3Tc	5/4/2007	dlsvr01.asus.com/pub/ASUS/nb/F3Tc/F3TcAS217.zip
ECS 662/1066T-M2	5/28/2007	www.ecs.com.tw/ECSWebSite/Downloads/DownloadFile.aspx?catid=1&driverid=3768&areaid=2&LanID=9
EVGA nForce 670 Intel	4/19/2007	ftp://ftp.evga.com/Bios/NF67_P3.exe
MSI K9NBPM2-FID	4/10/2007	download3.msi.com.tw/support/bos_exe/mbd_bios/7252v54.zip
Shuttle Reflexion XPC	3/30/2007	hq1.shuttle.com/servlets/download?file_id=7271
Tyan Tiger K8SSA	4/17/2007	www.tyan.com/support_download_bios.aspx?model=S.S3870

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Extreme QX6800 2.93Ghz	$ 2775
Extreme QX6700 2.66Ghz	$ 2499
Quad Q6600 2.4Ghz	$ 1999
(4MB Cache, 1066Mhz FSB)	
E6700 2.66Ghz	$ 1769
E6600 2.40Ghz	$ 1669
E6420 2.13Ghz	$ 1625

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Quad Q6600 2.4Ghz	$ 1445
(4MB Cache, 1066Mhz FSB)	
E6700 2.66Ghz	$ 1208
E6600 2.40Ghz	$ 1105
E6420 2.13Ghz	$ 1065
E6320 1.86Ghz	$ 1039

$1039

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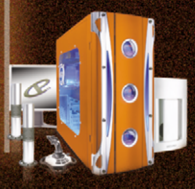
(4MB Cache, 1066Mhz FSB)	
E6700 2.66Ghz	$ 1069
E6600 2.40Ghz	$ 969
E6420 2.13Ghz	$ 925
E6320 1.86Ghz	$ 899



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DIGITAL ECONOMY

Compiled by Steve Smith

The Job Search

Want to bring "Entourage," "The Sopranos," and "Deadwood" to the next media level? Like to play with all the latest new trends and toys? Then there's a warm executive chair waiting for you at HBO. The VP of Emerging Technologies Research has got some gig: scoping out bleeding-edge technologies and platforms on which to extend the HBO media brands. You will pay special attention to audio and video gadgets, says the company. So, we're thinking that Mister Vice President really gets to play with every mobile TV cell phone and iPod model his expense account can bear. According to the job description, you "present findings and make recommendations to key decision makers within the organization." So, we're thinking you get to show off these new toys to guys in even nicer offices and more expensive suits than yours.

No, seriously, they don't hand this choice gig to any gadget boy strolling the aisles of Best Buy. You will need a decade of experience with online and offline technologies and an understanding of DRM, podcasting, RSS, Web services, and mashups. Of course, you'll also take the heat when one of these platforms you recommend goes south. It may have seemed like a good idea at the time to give the Zune exclusive rights to distribute "The Sopranos" on portables. But, remember, this is HBO. They know Tony.

5%

PERCENT OF 18- TO 24-YEAR-OLDS WHO HAVE STREAMED VIDEO ONLINE

(IPSOS)

51.7%

Percent of U.S. Internet users who are female

(eMarketer)

71.2%

Percent of male Internet users who accessed online video in 2006

55.0%

Percent of female Internet users who accessed online video in 2006

(eMarketer)

$41 billion

Amount telcos will spend on equipment this year

(iSuppli)

iTunes Is The New Napster

According to Ipsos Insight, Apple's iTunes has nearly matched the legendary Napster as the most recognized brand in digital music.

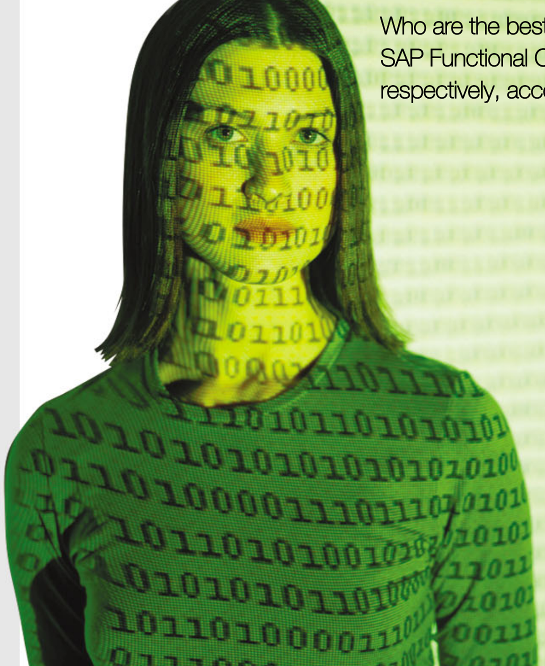
Total Awareness Of Fee-Based Digital Music Services

Service	2004	2005	2006
Napster	79%	79%	68%
iTunes	46%	57%	66%
MySpace	N/A	16%	54%
Yahoo Music	N/A	49%	53%

Source: Ipsos Insight (indicates awareness of the music brand among music downloaders aged 12 and older)

The Plum Jobs Of IT

Who are the best-paid tech workers? Technical Consultants and SAP Functional Consultants are making $83 and $76 an hour, respectively, according to the Yoh Index of Technology Wages.



Job Title	Hourly Wage
Technical Consultant	$83.72
SAP Functional Consultant	$76.67
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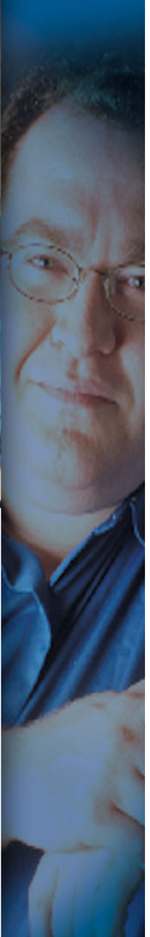
ETL Developer	$66.52
Project Manager	$60.73
Clinical Research Associate	$59.83
Database Administrator	$59.80
Java Developer	$57.27
.NET Developer	$53.40

The Saint

Vista Bombs

by Alex St. John

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM-quality entertainment content over the Web.



Well, I hate to say I told you so, but after five years in development and 50 million lines of code, Vista arrived to deafening accolades of silence. Before Vista launched, I wrote several columns warning *CPU* readers that the early beta versions looked critically flawed, insecure, bloated, and broken for gaming. What I heard from many readers and Microsoft was, "Oh that's just the beta, it will all be fixed before the launch." The best thing about Vista having launched is that I'm no longer the only one saying these things. Vista is out there for everyone to judge and is shaping up to be a bigger, more expensive failure for Microsoft than Windows Me. Here are just a few interesting quotes—from sources other than myself, for a change.

For starters, here are a couple from a CNET News article called "Dell Brings Windows XP Back On Home Systems" (news.com.com/Dell+brings+back+XP+on+home+systems/2100-1046_3-6177619.html?tag=nefd.lede):

"In announcing PC sales data, Gartner said this week that Vista's launch 'had very limited impact on overall worldwide shipment demand on a quarterly basis.'"

"'That there is remaining demand from some segment of (the) consumer market points to the inability of Vista to resonate with consumers,' IDC analyst Richard Shim said."

Not only has Vista failed to drive growth in PC sales as has traditionally been expected of a major Windows release, it actually seems to be depressing the PC market to the extent that even the leading OEMs are scrambling to get XP SKUs back into the market to avoid losing sales. What's ironic is that even Microsoft has not adopted Vista internally because its own development tools don't work on it.

Every time I complain about Vista's obnoxious "security" measures I get blasted with emails from folks claiming they'll happily suffer any intrusive dialogs and loss of functionality for better security. Now folks are finally starting to realize that Vista's fabled security is just as big a myth as it has been every time Microsoft has touted this as the big feature of its newest OS.

In a BBC News article titled "Windows 'Fails' Active Virus Test" (news.bbc.co.uk/1/hi/technology/6331959.stm), we find the following revelation:

"The security testing group found that Live OneCare missed far more active viruses than any other program tested."

Let me see if I've got this straight . . . Windows Vista + Microsoft's new premium online security service Live OneCare is *less* secure than Windows XP + Symantec Antivirus for most common virus attacks? If Microsoft's product, Vista, isn't secure, what makes Microsoft qualified to sell a security service? Is it really a shock to anybody that Microsoft's "premium security service" is the *least* secure solution on the market for Vista? Scott Adams couldn't have made this up for a "Dilbert" strip.

According to one source, Microsoft managed to sell 244 copies of Vista in China before it was cracked and widely pirated. The fact that Vista is readily pirated in China, India, Brazil, and other third-world countries is an important comment on Microsoft's new security measures. It's one thing to casually screw up consumer security, but OS sales are Microsoft's bread and butter—the thing the company has the most incentive to protect—and it can't even get *that* right.

Vista is also the first consumer product I've ever heard about that tries to make *disabling* media a feature. I've talked about Vista breaking games extensively, of course, but Vista also does a great job of breaking music and video apps.

Here's the "Executive Executive Summary" from a whitepaper called "A Cost Analysis Of Windows Vista Content Protection" (www.cs.auckland.ac.nz/~pgut001/pubs/vista_cost.html) that would be a comical read if it weren't so tragic:

"The Vista Content Protection specification could very well constitute the longest suicide note in history."

Naturally I intended to cling to XP as long as humanly possible, but recently Microsoft gave me the single best reason it could muster to upgrade to Vista. Last week the company shipped me a "CRITICAL SECURITY UPDATE!!!!!!!!" notification via Windows Update. Naturally I clicked it to get the latest patch to shield me from the scary, adware-riddled Internet, and guess what? Up popped an ad selling an upgrade to Vista! Now I've seen Microsoft abuse Windows Update for everything, and I can finally move on. ▲

Not only has Vista failed to drive growth in PC sales . . . it actually seems to be depressing the PC market . . .

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DREAM HARDWARE

These Gizmos Don't Sing It, They Bring It

Something old, something new, some things I'd like to borrow, and something Cowboy blue. This month's Dream Hardware is all over the map. Let's start in Texas.

by Marty Sems

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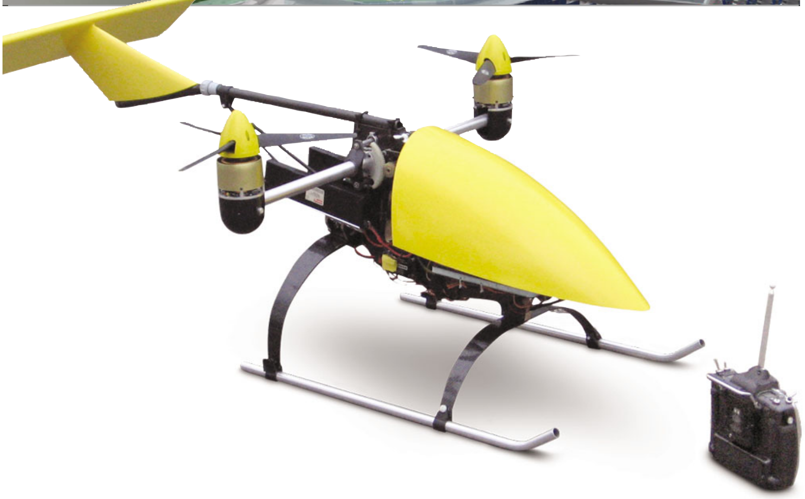
Dallas Cowboys Stadium Video Boards

These don't exist yet. I don't know what they'll cost. No manufacturer has been tapped, and even the underlying technology is still, ah, up in the air. (I'm guessing LED.) What I do know is that they'll likely be the biggest video screens in the world. Measuring 50 feet tall and 180 feet wide, the boards will entertain football fans in the Dallas Cowboys' colossal new stadium (stadium.dallascowboys.com). Like the stadium itself, team spokesman Brett Daniels says that the video screens are still a couple of years out. Attack of the 50-Foot Cheerleaders, anyone?



Gress Aerospace eVader

This 14-pound VTOL prototype isn't as interesting for what it is as for what it will become. Gress Aerospace's 40%-scale eVader (www.gressaero.com) is phase two of a plan to develop a personal air vehicle, or PAV. "The vehicles are unique because we use the two lift fans' gyroscopic properties for pitch control, thereby eliminating the need for other devices like extra fans (complex and larger vehicle footprint) or control vanes below the fans (ineffective—they give marginal control and stability)," says director Gary Gress. As for a timeframe, "we're looking at about one year for a scaled-up [full-sized] version of the basic eVader platform, which can carry a human pilot." The PAV is too far out for a commercial price estimate, but you may someday see it in military, civil, and fire/rescue roles.

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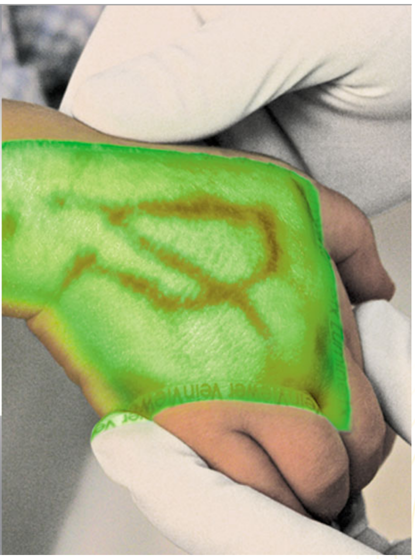

Luminetx VeinViewer

Here's some hardware that really does what it says. The VeinViewer ($29,500; www.luminetx.com) has been around for a while, taking hospitals and clinics by storm and gaining accolades along the way. What it does is simple. It analyzes the blood vessels just under a patient's skin using harmless, near-infrared light. Next, it projects a real-time map of the veins and other subcutaneous vessels directly onto the skin so a health care professional can make an accurate needle stick. By taking the guesswork out of this tricky art, the VeinViewer could make your next PICC line or IV a piece of cake. It's not recommended as a social icebreaker, however, unless you want to use it to cure your friends' beer goggles. ▲

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Midrange Mania

Nvidia's New 8-Series Cards Clocked & Compared

For the first few months of its existence, Nvidia's GeForce 8 series consisted solely of the flagship GeForce 8800 GTX and 640MB 8800 GTS. These two cards have unquestionably been the most powerful on the market since their release, but Nvidia's M.O. these past few years hasn't been to focus solely on the high end. Yes, Nvidia wants to hold on to the overall performance crown, but it's more important to have high-performance parts across a wide price range than releasing top-shelf hardware few can afford. It's with this strategy in mind that the company has designed its last few scalable GPU architectures.

To put it simply, having a scalable GPU architecture lets Nvidia remove functional blocks from a design to reduce transistor count and die size, without sacrificing any features. This is what the company did with mainstream GeForce 6 and 7 series cards that were derived from the GeForce 6800 and GeForce 7800/7900 architectures, respectively. And it's also what they've done with the newly released GeForce 8600 series.

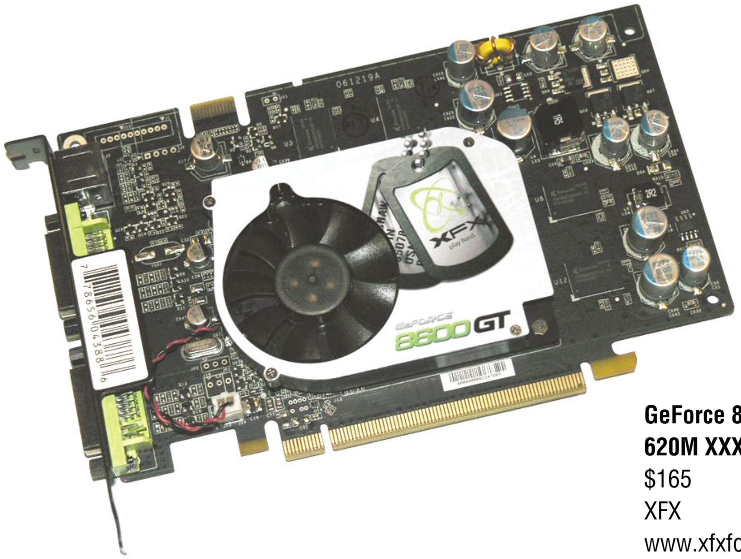
The initial members of the GeForce 8600 series are the GeForce 8600 GTS and GeForce 8600 GT. The GeForce 8600 GTS is built around a new, unified, DirectX 10-class GPU derived from the G80 architecture that's at the heart of the GeForce 8800 GTX. The GeForce 8600 GPU features an 80nm manufacturing process, 32 stream processors, and 8 ROPs. A modification to the G80's stream processor partitions lets the GeForce 8600 utilize eight addresses per clock, double that of the 8800. If you remember, the high-end GeForce 8800 GTX and 8800 GTS are outfitted with 128 and 96 stream processors, respectively. Nvidia's reference specifications for the GeForce 8600 GTS call for the following: a default GPU clock speed of 675MHz, a shader (stream processor) clock speed of 1.45GHz, and 256MB of GDDR3 memory clocked at 1GHz (2GHz effective) and utilizing a 128-bit interface for a maximum 32GBps of memory bandwidth.

Reference GeForce 8600 GTS cards sport a slim, single-slot cooler, a pair of dual-link DVI outputs, and an HDTV output. The cards require a 6-pin PCI Express supplemental power connection, and Nvidia recommends a 350W power supply unit for single-card configurations. (You'll need 450W for two GeForce 8600 GTSes in SLI.) The GeForce 8600 GTS can also be HDCP-capable (and a second-generation PureVideo HD engine helps relieve some of the CPU's workload during encrypted HD DVD/Blu-ray playback), but it's up to the discretion of board partners to include the necessary CryptoROM.

The GeForce 8600 GT and GTS have similar specifications, but there are a couple of notable differences. The GeForce 8600 GT boasts the same number of stream processors and ROPs, 256MB of GDDR3, and a 128-bit interface. The GT's reference specifications, however, recommend a 540MHz GPU clock, a 1.18GHz shader clock, and a 700MHz (1.4GHz effective) memory clock speed (22.4GBps max bandwidth). But the GeForce 8600 GT's lower frequencies also lowered its power requirements, and cards do not require supplemental power. The differences between the GT and GTS also let Nvidia use a smaller PCB with the 8600 GT, which further reduces cost.

Just prior to the introduction of the GeForce 8600 series, Nvidia also unveiled a more powerful, upper-mainstream card, the 320MB GeForce 8800 GTS. The 320MB GeForce 8800 GTS is essentially the same card as the original 8800 GTS 640MB, with one obvious difference: The 320MB model simply has half the amount of frame buffer memory. According to Nvidia's reference specifications, the original 640MB 8800 GTS and new 320MB model share the same GPU and memory clock speeds, 320-bit memory interface, 96 stream processors, PCB, and cooler.

But there's more to the story than Nvidia's reference specifications. Because Nvidia has let its board partners overclock their



GeForce 8600GT
620M XXX Edition
$165
XFX
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products, GeForce 8600 and 8800 cards from different companies may operate at different core GPU and memory frequencies. To illustrate how varying clock speeds affect the current crop of mainstream GeForce 8600 and 8800 series cards' performance, I rounded up a sextuplet of cards that are all clocked at different speeds. As you'll see, a few extra megahertz can have a marked impact on performance.

GeForce 8600GT 620M XXX Edition

XFX's GeForce 8600 GT 620M XXX Edition is the least expensive entrant in this roundup but certainly has a bit of attitude, thanks to its dark-colored PCB and neon green DVI connectors. The card's small, single-slot cooler is adorned with a custom XFX decal. And as is typical with XFX's XXX Edition cards, it's overclocked right out of the box. This particular XFX card sports a 620MHz GPU with 800MHz (1.6GHz effective) memory.

The XFX GeForce 8600 GT 620M XXX Edition's accessory bundle includes an S-Video cable, a single DVI-to-VGA adapter, a multilanguage quick installation guide, and an obligatory driver CD. There are no games or other value-add software, which makes this card's bundle meager at best. XFX does go all-out with its warranty coverage. XFX recently made some changes to its Double Lifetime warranty policy to better serve the enthusiast community. In the days leading up to the GeForce 8600 launch, XFX said it would continue to honor its warranty policy so long as the card isn't physically damaged or missing components. Translation: Feel free to overclock this and other XFX cards covered under warranty even further.

GeForce 8600 GTS 730M XXX Edition

In a move typical of XFX, the company also has an entire lineup of GeForce 8600 GTS cards. The premium model is the GeForce 8600 GTS 730M XXX Edition, but there are two less expensive XFX-branded GeForce 8600 GTS cards available. The cheaper 8600 GTSes have expectedly lower GPU and memory clock speeds.

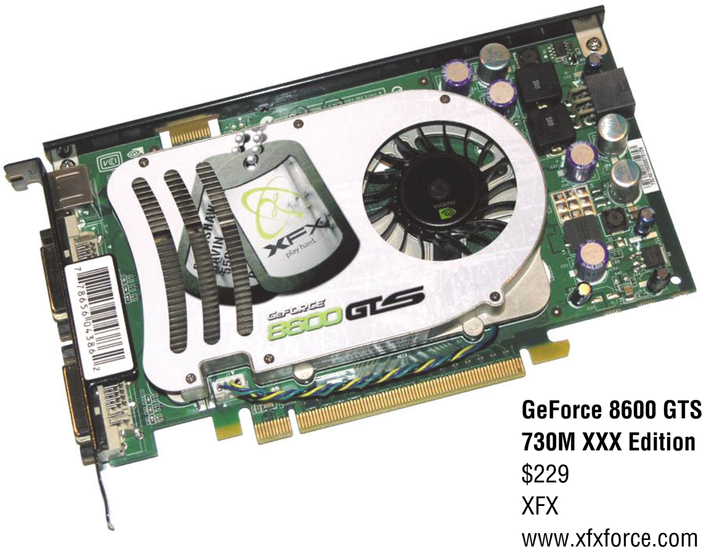
As its name implies, the XFX GeForce 8600 GTS 730M XXX Edition sports a 730MHz core clock frequency; its memory is clocked at 1.13GHz (2.26GHz effective), making the core and memory clocks 55MHz and 130MHz faster than Nvidia's reference specification, respectively. The XFX GeForce 8600 GTS XXX Edition also sports a custom fan shroud over its single-slot cooler and a heavy-duty reinforcement bar that runs the length of the top edge of the PCB.

The same assortment of cables and adapters as the 620M XXX Edition were included in the box along with the card itself, but the 8600 GTS 730M XXX Edition also includes a full version of Tom Clancy's Ghost Recon: Advanced Warfighter. G.R.A.W. isn't the newest game on the block, but its inclusion with this card is welcomed. I'm all for anything that adds to a product's overall value, especially when it's a decent game.

EN8600GTS S.T.A.L.K.E.R. Edition

Asus also has multiple GeForce 8600 GTS cards in its lineup. The version I acquired for this roundup was the EN8600GTS S.T.A.L.K.E.R. Edition. This card sports the same basic green PCB, outputs, and single-slot cooler of Nvidia's reference GeForce 8600 GTS. The Asus EN8600GTS S.T.A.L.K.E.R. Edition is, however, treated to a custom fan shroud complete with imagery from the recently released S.T.A.L.K.E.R.: Shadow of Chernobyl. Asus will be including a full version of S.T.A.L.K.E.R. with this card, along with a DVI-to-VGA adapter, an HDTV output cable, and a driver CD that also includes a handful of proprietary Asus utilities.

The Asus EN8600GTS is also factory-overclocked. The card I tested has its GPU frequency cranked up to 745MHz, and its memory clock was set to 1.145GHz (2.25GHz effective). Those clock speeds made the EN8600GTS the fastest 8600 series card I tested. And a great, cutting-edge game is included in its bundle. But this card is also the most expensive GeForce 8600 of the bunch, and Asus' three-year warranty pales in comparison to XFX's.



GeForce 8600 GTS 730M XXX Edition
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CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Features & Specifications

	XFX GeForce 8600 GT XXX Edition	XFX GeForce 8600 GTS 730M XXX Edition	Asus EN8600GTS S.T.A.L.K.E.R Edition	MSI NX8600GTS T2D256E OC	Asus EN8800GTS/ HTDP/320M	XFX GeForce 8800 GTS 320M XXX Edition
Fabrication process	80nm	80nm	80nm	80nm	90nm	90nm
Transistors (in millions)	289	289	289	289	680	680
Core clock	620MHz	730MHz	745MHz	700MHz	513MHz	580MHz
Stream processors	32	32	32	32	96	96
Memory clock (effective clock)	800MHz (1.6GHz)	1.13GHz (2.26GHz)	1.145GHz (2.29GHz)	1.05GHz (2.1GHz)	792MHz (1.58GHz)	900MHz (1.8GHz)
Memory interface	128-bit	128-bit	128-bit	128-bit	320-bit	320-bit
Memory bandwidth	25.6GBps	36.2GBps	36.6GBps	33.6GBps	63.3GBps	72GBps
Frame buffer	256MB	256MB	256MB	256MB	320MB	320MB
ROPs	8	8	8	8	20	20

NX8600GTS T2D256E OC
$175
MSI
www.msicomputer.com
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EN8800GTS/HTDP/320M
$305
Asus
www.asus.com
●●●●

GeForce 8800 GTS 320M XXX Edition
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NX8600GTS T2D256E OC

At first glance, MSI's NX8600GTS T2D256E OC looks nothing like the other GeForce 8600 cards in this roundup. The NX8600GTS T2D256E OC features a bright red PCB with yellow DVI outputs, and it was the only card of the bunch to feature a dual-slot cooler. This may seem like a disadvantage, but the MSI NX8600GTS ended up being much quieter than the Asus' and XFX's cards. The single-slot reference coolers used on Asus' and XFX's cards emitted a high-pitched whine when spinning at full speed that wasn't present with the MSI card.

As the "OC" in its name suggests, MSI also overclocks its 8600 GTS at the factory with a 700MHz core and 1.05GHz memory (2.1GHz effective). These higher than reference clock speeds give the MSI NX8600GTS T2D256E OC an edge over stock GeForce 8600 GTS cards, but it actually finished a few frames per second behind the XFX and Asus offerings.

The NX8600GTS T2D256E OC's basic accessory bundle consisted of a driver/utility CD, S-Video cable, HD component output dongle, two DVI-to-VGA adapters, a dual Molex-to-6-Pin PCI-E power adapter, and a quick user's guide. The NX8600GTS T2D256E OC's bundle doesn't stand out, nor does its performance. But at a price about $50 lower than the other GTS cards represented here, MSI's offering is definitely the better value.

EN8800GTS/HTDP/320M

Save for its custom fan shroud, the Asus EN8800GTS/HTDP/320M is a duplicate of Nvidia's reference design. The card sports the same cooler and PCB, and its GPU and memory are clocked at 513MHz and 792MHz, respectively.

The EN8800GTS/HTDP/320M does ship with a very nice assortment of accessories and software, however. Included in the box were an HD component output dongle, a dual Molex-to-6-Pin PCI-E power adapter, a users manual, a leather Asus-embossed CD case, and a group of five CDs. One of the discs contained the drivers, and another had a digital users manual and some proprietary utilities (Splendid, Video Security Online, Game LiveShow, Game Replay, Game Face-Messenger, and Gamer OSD). The remaining three discs consisted of full versions of 3DMark06, G.R.A.W., and RACE—The Official WTCC game. The software and games

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Performance Results

To assess the performance of the six midrange GeForce 8 series cards in this roundup, I installed them in a 2.9GHz Intel Core 2 Extreme X6800-powered test rig, complete with 2GB of Corsair Dominator RAM and an Evga nForce 680i SLI motherboard. I installed Windows XP Professional SP2 on the machine, along with the April 2007 DX 9.0c redistribution package, Nvidia's ForceWare v158.16 video drivers, and v9.53 of Nvidia's nForce chipset drivers.

My Half Life 2: Episode 1, Quake 4, and Prey benchmarks consisted of custom demos that I ran using each game's timedemo option, while I ran 3DMark06 and F.E.A.R. benchmarks using each application's built-in testing tool. Because S.T.A.L.K.E.R. doesn't have an integrated performance assessment option, I tested that game using FRAPS and a two-minute manual run-through of the game's initial level that included both indoor and outdoor environments. With the exception of 3DMark06, I ran all of my tests with 4X antialiasing and 16X anisotropic filtering.

If you focus strictly on the performance of the GeForce 8600 GT and GTS cards, you'll see that their performance scaled with their respective GPU and memory clock speeds. Expectedly, the performance of the 320MB GeForce 8800 GTS cards also scaled based on each card's clock speeds. What's more interesting to note is the large performance deltas that separate the 8600s from the 8800s. Although they lack the second-generation video engine found in the 8600 series, the 8800s simply blow the 8600s away in terms of gaming performance .The additional $70 to $90 investment is well worth it for gamers. ▲

	XFX GeForce 8600 GT 620M XXX Edition	XFX GeForce 8600 GTS 730M XXX Edition	Asus EN8600GTS S.T.A.L.K.E.R Edition	MSI NX8600GTS T2D256E OC	Asus EN8800GTS/ HTDP/320M	XFX GeForce 8800 GTS 320M XXX Edition
3DMark06 (1,280x1,024)						
Overall score	5350	6217	6344	5875	9065	9777
Shader Model 2.0	2239	2628	2696	2521	3977	4320
Shader Model 3.0/HDR	1909	2304	2355	2224	3813	4349
Half Life 2: Episode 1						
1,280 x 1,024	49.74	56.46	59.38	54.98	101.28	108.41
1,600 x 1,200	29.75	34.42	35.65	33.16	73.38	75.67
F.E.A.R. v1.08						
1,280 x 1,024	36	42	43	41	77	84
1,600 x 1,200	25	30	30	29	48	50
Quake 4 v1.3						
1,280 x 1,024	63.6	76.2	78.2	72.4	121.9	130.4
1,600 x 1,200	46.4	55.8	56.6	53.2	97.3	104.3
Prey v1.3						
1,280 x 1,024	41.1	49.6	50.5	47.2	88.3	98.1
1,600 x 1,200	29.8	35.8	36.3	33.4	65.9	72.4
S.T.A.L.K.E.R. v1.0001						
1,280 x 1,024	24.5	27.9	28.3	27.8	52.8	55.1
1,600 x 1,200	17.7	19.2	21.1	18.4	40.9	42.6

Asus bundles with the EN8800GTS/HTDP/320M certainly add to the card's overall value, but Asus went a little light on the cables: S-Video and component cables were noticeably absent.

GeForce 8800 GTS 320M XXX Edition

XFX's GeForce 8800 GTS 320M XXX Edition is essentially a physical copy of Nvidia's reference card, as well. It too has a custom decal affixed to its fan shroud, but unlike Asus' offering, this particular model from XFX is factory-overclocked. The GPU core of XFX's GeForce 8800 GTS 320M XXX Edition card is cranked to 580MHz, and the memory hums along at 900MHz (1.8GHz effective).

Bundled with the XFX GeForce 8800 GTS 320MB XXX Edition card are a pair of DVI-to-VGA monitor adapters, an HD component output dongle, an S-Video cable, a users manual, and a couple of CDs. One disc contained the obligatory drivers, while the other contained a full version of G.R.A.W.

The Double Lifetime warranty mentioned earlier applies to this card, as well. With its relatively high clock speeds and GeForce 8800 series GPU, this card turned out to be the fastest in this roundup. But the kind of performance this card offers comes at a price: It's also the most expensive of the group. ▲

by Marco Chiappetta

A Tour Guide For Your Dashboard

Six GPS Units To Get You There Quickly

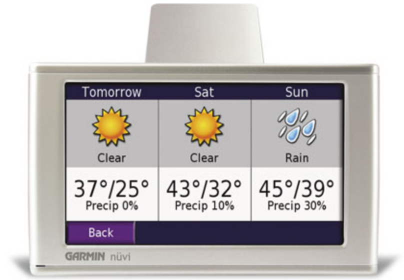
We'll admit: When it comes to building a computer, learning a new game, or figuring out a new gadget, instructions are the last thing on our mind. After all, instructions are only for people who are less . . . technically inclined, right? Despite our reluctance, there comes a time where each of us must follow directions, and navigating to an unfamiliar place is one such occasion. Of course, you can always hop on MapQuest or Google Maps and print off directions, but where's the fun in that? A true power user would rather use a GPS system to find a snack, place to stay, or ATM while en route to the next LAN party.

In-car GPS units have come down in price over recent years. But just what will a few Benjamins buy? And how do the lesser-known brands stack up against the likes of the top manufacturers? To find out, I took a close look at six portable, in-car units with a variety of features and prices.

How I Tested

To mimic everyday use as much as possible, I developed my own testing course that evaluated a variety of routing situations and also included a few wrong turns and searches for nearby POIs (points of interest). I also paid close attention to each unit's user interface, touch responsiveness, and additional features.

I put each unit through a number of routes in order to test its routing capabilities. My first test involved a short, in-town route; the second test trekked across town in a way that interstate travel would be unlikely; the third test included a longer, across-town route that could involve interstate travel; and my final test involved a short route to a nearby restaurant that I found in the POI database. For each route, I made note of the route taken, the number of miles, and estimated time of travel.



nüvi 680
$1,071.41
Garmin
www.garmin.com
●●●●◖

To test each unit's rerouting capabilities, I purposely took a few wrong turns to see how a unit would react if you missed a turn or had to reroute due to construction.

Routing accuracy and efficiency are important, but it's also important to consider the UI and additional features of a GPS unit. Although most units will get you to your destination (albeit with different routes), features, price, and UI quality vary dramatically—not always in predictable ways.

Garmin nüvi 680

At the time of this writing, Garmin's top-of-the-line GPS was the nüvi 680. With an FM transmitter, MP3 player, MSN Direct, and more, this GPS unit does much more than just navigation. The nüvi 680 also has integrated Bluetooth connectivity so you can use the built-in microphone and speaker for hands-free calling with a Bluetooth-equipped phone. In addition, the integrated FM transmitter lets you listen to MP3s, audio books, and navigation instructions through your car's stereo system. While navigating and listening to music, the nüvi 680 pauses the song in order to deliver turn-by-turn directions.

I was pleased with the nüvi 680's quick rerouting capabilities that announce when the unit is recalculating due to a wrong or missed turn. In all four of my tests, the nüvi 680 claimed the shortest travel time. Because travel time will vary depending on time of day, traffic, and stop lights, it's impossible to guarantee the nüvi will always take the route that requires the least amount of time. All in all, I was pleased with the route taken in all four tests.

During navigation, the nüvi 680 will tell you where to turn and will speak the names of streets.

The nüvi 680's user interface was easy to use, and the touchscreen was very responsive. The internal speaker was adequate for my uses, and the FM transmitter made listening to tunes while navigating easy. The sound quality through the FM transmitter was good, although I did have to change channels to avoid interference while traveling through larger cities.

For a top-of-the-line navigation device, the Garmin nüvi 680 includes a number of features to take you beyond navigation. Pair these extras with strong navigation capabilities, and you have a winner.

Magellan Maestro 4050

Magellan's latest Maestro 4050 wasn't officially released at the time of this writing, so Magellan sent me a preproduction unit to use for my testing. The Maestro 4050 is unique in that it is the only car navigation system to include AAA travel information. This information is especially handy for travelers who prefer to hop in the car and go without a lot of preparation.

Another unique feature that comes with the Maestro 4050 is voice command capabilities for commonly used commands. With this feature, you can ask for Roadside Assistance, tell the device to Go Home, or find the Nearest Restaurant. In my tests, the voice command capabilities worked well and were easy to use.

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

The Maestro 4050's routes were on par with the other devices. While navigating, the Maestro 4050 showed icons for gas stations and other POIs along the way. When I approached a turn, its display switched from a traditional map to a split screen that shows a smaller map with large graphical turn information.

Maestro 4050
$699.99
Magellan
www.magellangps.com
●●●●

N60i
$449.95
Navman
www.navman.com
●●●

With Magellan's SayWhere text-to-speech, the Maestro 4050 will speak the name of streets on which to turn. When I veered off track, the Maestro 4050 verbally announced that it was calculating a new route. Once it found a new route, the Maestro 4050 spoke new instructions immediately.

Although it doesn't have the multimedia capabilities of some of the other devices in this roundup, the Maestro 4050 makes a name for itself with AAA information and voice command functionality.

Navman N60i

For some users, an image-based UI makes navigation easier than the traditional method of using a text-based destination list. With the Navman N60i's NavPix feature, you can quickly select a destination by touching a picture. The N60i comes with a few preset locations, but with the integrated 1.3MP camera, you can create navigable pictures of your own saved locations.

Unlike most GPS units that rely solely on a touchscreen for input and controls, the N60i has five hardware buttons on its front. Two of these buttons, the Gas and Park buttons, give you one-touch access to some of the most commonly used POI categories.

Although it took a rather odd route for my first test, the N60i guided me to my destination. This route required a bit of backtracking but was still within a mile of the other devices' calculations. In the other tests, the N60i took routes that were on par with the other devices. When rerouting for construction, the N60i took a little while to realize it needed to recalculate the route, but once it did, the calculation was pretty quick. While navigating with the N60i, you'll notice that it displays the name and street number of your current location. This can be helpful if you're on the lookout for a particular block.

The N60i comes with two U.S. English voices, but they offer only turn prompts and don't reference street names. Still, the voice instructions to turn left or right are clear, and the name of the street is displayed on-screen.

NavPix and the integrated 1.3MP camera are features that aren't available on many GPS devices today. Because of the ease of use and convenience that picture navigation adds, I wouldn't be surprised to see this feature more in the future.

Netropa Intellinav 3

Netropa was kind enough to send me a preproduction model of its newest Intellinav 3, which will launch in July. Although my preproduction test unit had a couple of glitches, Netropa assured me that these minor setbacks were already fixed in the upcoming retail model.

Intellinav 3
$349
Netropa
www.intellinav.com
●●●●

The Intellinav 3 has MP3 and photo-viewing capabilities and a Historic Traffic Pattern feature on the device. The Historic Traffic Pattern feature was still in development when Netropa sent me the review unit, so I wasn't able to test this feature.

In all four tests, the Intellinav 3 took acceptable routes. In my POI test, the Intellinav 3 tied with the Garmin nüvi 680 and the Magellan Maestro 4050 for the shortest time. I was impressed with its quick rerouting capabilities, as well.

Unlike most of the devices at the lower end of the price spectrum, the Intellinav 3 includes text-to-speech capabilities, which means it will speak the names of the streets on which to turn.

The Intellinav 3 has a responsive touchscreen that shows estimated time to arrival, remaining time, remaining distance, and speed at the bottom of the screen. Many devices toggle this information in a corner of the display, but I liked seeing it simultaneously in a thin bar at the bottom. Another handy feature is the ability to save locations for future use. You can even save your current location as a favorite.

My contact at Netropa said they purposely didn't use an antiglare screen in order to avoid a washed-out appearance. He also mentioned that Netropa intends to bundle an antiglare film sticker with the final device. Although the 3.5-inch colorful display did glare in direct sunlight, I could read it as long as the backlight was on.

Considering I had a preproduction unit that will likely be improved by the time it hits retail stores, I was impressed with the Intellinav 3.

Pharos GPS Phone 600

As its name suggests, the Pharos GPS Phone 600 isn't your average GPS navigation device: It combines a GPS receiver, quad-band GSM cell phone, Wi-Fi and Bluetooth connectivity, Windows Mobile 5, Microsoft Live Search, 2MP digital camera, FM radio, and more into its sleek form that's smaller than many of today's smartphones.

With a price that's less than some of the GPS devices in this roundup, the GPS Phone 600 includes Pharos' Ostia navigation software. If you want to use your own Windows Mobile-compatible GPS software, or if you have special GPS software for things such as disaster assessment or off-street uses, Pharos also offers the GPS Phone 600e, which costs $100 less and lacks maps and the Ostia software.

The GPS Phone 600 yielded acceptable results for all but the second navigation test, which avoids interstate travel. In this test, the GPS Phone 600 backtracked a number of miles to the interstate before it directed me to my destination.

The Ostia navigation software included with the GPS Phone 600 doesn't have text-to-speech functionality but does display the name of the street on-screen.

While driving, the Ostia software displayed a moving map with labeled street names.

During testing for wrong turns or construction, the GPS Phone 600 showed that I was off track and proceeded to recalculate. But instead of finding a completely new route, some of the recalculated routes asked me to turn around to get back on track with the original route. This may not be the most efficient in all cases, but I reached my destination nonetheless.

Although I was slightly disappointed in the routing functionality, I have to give the GPS Phone 600 a lot of credit for packing a number of features into a small package. As you would expect with a converged device, there are a few tradeoffs, but overall, I was pretty pleased with the GPS Phone 600.

GPS Phone 600
$699.95
Pharos
www.pharosgps.com
●●●

TomTom GO 910

TomTom's high-end GO 910 falls in the middle of my price range for this roundup. Still, the GO 910 is packed with features, including a 20GB hard drive with 12GB of free space to store plenty of MP3s, audio books, and photos. The GO 910 also has Bluetooth connectivity to connect your cell phone, headset, car speakers, or headphones.

This GPS device had some of the most natural-sounding computer-generated voices, though prerecorded human voices are also available. The GO 910 supports text-to-speech for turn-by-turn instructions with spoken street names, though the street

What You'll Get

	Garmin nüvi 680	Magellan Maestro 4050	Navman N60i
Display Size (Inches)	4.3	4.3	4.3
Dimensions (Inches, HxWxD)	2.9 x 4.9 x 0.9	3.75 x 5 x 0.88	3.25 x 5.45 x 0.91
Weight (ounces)	6.2	8.5	8.5
Bluetooth	Y	Y	N
Text-To-Speech (Announces Streets By Name)	Y	Y	N
MP3 Player	Y	N	N
Audio Book Player	Y	N	N
Preloaded Maps	City Navigator NT for North America	United States, Canada and Puerto Rico	United States and Canada
Remote Control	N	N	Y
Expansion Slot	SD	SD	SD
Included Accessories	MSN Direct receiver with integrated vehicle power cable, one year free MSN Direct service, vehicle suction cup mount, AC charger, dashboard disk, USB cable, leather carrying case, and documentation	Windshield mount and cradle, cigarette lighter adapter, protective pouch, AC power adapter, USB data cable, and adhesive disk	Auto power adapter, carrying case, remote, AC power pack, USB cable, car-mounting bracket, adhesive dashboard mounting disc, documentation, and CDs with SmartST Desktop, NavAlbum, and map backups
Additional Features	Three U.S. English voices, FM transmitter, hands-free calling, one year free MSN Direct service, travel kit, accepts custom points of interest, JPEG picture viewer, Garmin Lock, and optional software on plug-and-play SD cards for language translation, detailed travel guide, and more	Integrated AAA TourBook Travel Information, Roadside Assistance Details, Show Your Card & Save Locations, real-time traffic service with free three-month trial, voice command capabilities, hands-free calling via Bluetooth, 3 languages	1.3MP camera, NavPix navigation to pictures, Gas and Park buttons, and POI import capability
Price	$1,071.41	$699.99	$449.95
URL	www.garmin.com	www.magellangps.com	www.navman.com
CPU Rating	4.5	4	3

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

GO 910
$499.95
TomTom
www.tomtom.com
●●●●◐

names are only available on computer-generated voices. On the device, you'll also find support for TomTom PLUS services, including the ability to download additional prerecorded human voices (some of which are famous voices).

The GO 910 recalculated quickly when I forced it off track for the construction test. In all other tests, the GO 910 met my expectations. The internal speaker was loud enough for me to hear, and the car speed-linked volume feature adjusted the noise level of instructions to ensure I could always hear them.

The 4-inch touchscreen was responsive, and a built-in light sensor adjusted the brightness for maximum visibility during the day or night.

The list of features for the GO 910 seems nearly endless. The only thing the GO 910 may be lacking is pocketability: At 3.1 x 4.2 x 2.5 inches (HxWxD), this device is thicker than the rest. But depth is a small thing to sacrifice for this quality GPS navigation system.

TomTom ONE

At the other end of the TomTom spectrum, you'll find the TomTom ONE. Like its big brother, this little GPS device packs a punch. This smaller GPS measures 3.2 x 3.8 x 1 inches and is more pocketable than the GO 910. It doesn't have as many features as the GO 910, but the ONE includes the car speed-linked volume feature, an antiglare screen, TomTom HOME software, support for TomTom PLUS services through a Bluetooth connection to your phone, and downloadable POIs.

As I expected, the ONE took the same routes as the GO 910, so I have no complaints about its routing and rerouting capabilities. Although the ONE doesn't have text-to-speech capabilities, you'll see the street names on the colorful 3.5-inch display. The ONE supports 36 languages with 55 different voices, including some celebrity voices such as Yoda and Mr. T.

For the least expensive device in my roundup, the ONE includes a number of features and good accuracy. ▲

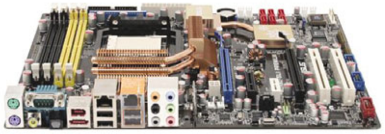
by Jennifer Johnson

ONE
$299.95
www.tomtom.com
TomTom
●●●◐

	Netropa Intellinav 3	Pharos GPS Phone 600	TomTom GO 910	TomTom ONE
	3.5	2.8	4	3.5
	3 x 4 x 0.88	4.45 x 2.34 x 0.61	3.1 x 4.2 x 2.5	3.2 x 3.8 x 1
	6.8	5.2	12	6.5
	N	Y	Y	Y
	Y	N	Y	N
	Y	Y	Y	N
	N	N	Y	N
	United States, Canada, Puerto Rico, and U.S. Virgin Islands	United States and Canada	United States, Canada, and Europe	United States and Canada
	N	N	Y	N
	SD	microSD	None	SD
	Windshield mount, AC adapter, car charger, 2GB SD card, and documentation	Car charger, auto mount, and a 2GB microSD card with maps of the United States and Canada and applications (Wireless ISP, Microsoft Live Search, Spb Mobile Shell, Spb Full Screen Keyboard, EZDial, and a free trial of WorldMate Professional)	Remote control, carry case, home dock (with home charger connector and USB connector), car charger, windshield dock, external microphone, audio cable, and documentation	SD card with map data, windshield holder, USB car charger and USB cable, documentation, and installation CD with user manual, additional voices, and TomTom HOME software
	Six languages including English, French, Spanish, Chinese, Korean, and Japanese; 2GB SD card (~1GB for map, 1GB for users to load MP3 or photos); and Historic Traffic Pattern	Quad-band GSM smartphone with GPRS/EDGE support; FM tuner; 2MP camera/camcorder with flash; Word, Excel, and PowerPoint Mobile; synchronizes with Outlook; Wi-Fi 802.11 b/g; microphone; speakerphone; Ostia navigation software; and GPS interaction with phone and contacts list	Speaks 36 languages in more than 50 voices, 20GB hard disk (12GB free), can connect to the car stereo using the provided audio cable, photo viewer, iPod controls, car speed-linked volume, light sensor, TomTom HOME, TomTom Buddies, safety camera database, TomTom PLUS, download additional voices, and speeding alert	36 languages and 55 different voices available, car speed-linked volume, antiglare screen, ready for TomTom PLUS services (Bluetooth-enabled mobile phone and GPRS data subscription required), TomTom HOME software, TomTom Buddies, and downloadable points of interest
	$349	$699.95	$499.95	$299.95
	www.intellinav.com	www.pharosgps.com	www.tomtom.com	www.tomtom.com
	4	3	4.5	3.5

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◐ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Asus M2N32-SLI Vista Edition



When AMD launched Socket AM2, it seeded analysts and media with motherboards to evaluate the new processors. The mobo AMD chose to showcase its AM2-based CPUs was Asus' M2N32-SLI. At the time, it was one of the better performing AM2 motherboards available. And it had an impressive list of features to boot.

Fast-forward to today, and the M2N32-SLI remains one of the more desirable socket AM2 mobos on the market. So, taking this already well-received motherboard and updating it to coincide with the launch of Vista seemed like a good move for Asus. And a good move it was; the new M2N32-SLI Vista Edition is one of the most well-rounded mobos for the AM2 platform.

In addition to all of the features inherent to Nvidia's nForce 590 SLI chipset, the Asus M2N32-SLI Vista Edition features eSATA support (via a Silicon Image controller), FireWire, and a built-in 512MB flash drive compatible with Vista's ReadyBoost. To supplement the integrated peripherals, Asus also includes the AI Remote and ScreenDuo. The credit card-sized AI Remote's receiver connects to one of the board's USB ports and offers an easy way to power up the system and launch and control some apps.

The ScreenDuo is a small LCD that gives users quick access to information like RSS feeds, email, and CPU and motherboard temperatures. It has a couple of buttons to the side of the screen for scrolling through the data, without using your mouse or keyboard. Asus also bundles in its usual assortment of cables, manuals, and software.

Copper heatpipes on the M2N32-SLI VE link the oversized copper heatsinks on the chipset and VRM together, which do a good job of keeping their components cool. And my overclocking experience was top-notch. The board was stable between 360 and 370MHz with minimal tweaking, and its BIOS is well-appointed and should please even the most avid overclocker.

With an Athlon 64 X2 6000+, 2GB of RAM, and a GeForce 8800 GTX installed, the M2N32-SLI churned though a multithreaded Cinebench 9.5 benchmark run in 26 seconds, and it completed the LAME MT encoding test in 44 seconds. A low-res F.E.A.R. benchmark yielded a frame rate of 241fps.

Asus' M2N32-SLI Vista Edition has a great features and an elaborate accessory bundle, and it's a good performer and overclocker. Anyone currently contemplating purchasing Socket AM2 motherboard should definitely put this one on their short list. ▲

by Marco Chiappetta

Specs: Socket AM2; Nvidia nForce 590 SLI; Max memory: 8GB (DDR2-800/667/533); ADI1988B HD (8-channel) codec; Dual Gigabit LAN RAID 0, 1, 0+1, 5; eSATA (Silicon Image 3132); Slots: 2 PCI-E x16, 1 PCI-E x4, 1 PCI-E x1, 2 PCI 2.2

M2N32-SLI Vista Edition
$225
Asus
www.asus.com
●●●◖

Patriot Memory PDC22G10100ELK

When it comes time to choose memory for a high-end PC, many builders immediately look to well-known, enthusiast-friendly brands, such as Corsair, Kingston, and Crucial. But take a minute to shop for DDR2 RAM at your favorite retailer and you'll likely find a multitude of brands all vying for your attention. And while some aren't quite as well-known as others, that doesn't mean you should dismiss them without giving them careful consideration.

One such brand is Patriot Memory. Although the company has been in existence for over two decades now, Patriot Memory is not as prominent in the enthusiast space as some of its competitors. But a recent move is likely to turn some heads and garner the company some serious attention.

Patriot has released a 2GB (2x 1GB) kit (PDC22G10100ELK) that is likely the fastest on the market. Rated for operation at 1,262MHz with 5-5-5-18 timings at 2.3V, the kit is just a hair faster than Corsair's 1,250MHz TWIN2X2048-10000C5DF, which was previously the fastest DDR2 RAM we had ever tested, and Patriot's kit doesn't require elaborate cooling. It also needs slightly less voltage to function properly. The Patriot PDC22G10100ELK kit has full support for Enhanced Performance Profiles, and, according to our contact at Patriot, it's going to be significantly less expensive than other PC2-10000+ kits.

We installed the PDC22G10100ELK kit on an Evga nForce 680i SLI board, powered by an Intel Core 2 Extreme X6800 processor, and manually set the memory timings to their rated settings. We achieved the necessary 1,262MHz by dropping our CPU's multiplier to 7x and raising the FSB to 1,684MHz (421MHz quad-pumped) with the memory and FSB ratio linked via the mobo's BIOS. The result was a CPU clock speed of 2,947MHz. At these settings, the Patriot kit broke the 8.2GBps mark in SANDRA XI SP1's memory bandwidth benchmark and scored 7086 in PCMark05.

If Patriot delivers this memory at the price they mentioned to us, we can't help but recommend it to enthusiasts looking for some seriously fast DDR2 RAM. ▲

by Marco Chiappetta

Specs: Capacity: 2GB (2x 1GB); Latencies: 5 (CAS Latency), 5 (tRCD), 5 (tRP), 18 (tRAS), 2T (Command Rate); Voltage: 2.3V; Lifetime warranty

PDC22G10100ELK
Approx. $350 to $400
Patriot Memory
www.patriotmemory.com
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CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

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Linksys WPSM54G

A wireless print server is a great way to put what's on a notebook's screen to paper without a cable connecting the computer to a printer. But, it's a one-way street that can't move faxes or scans from a multifunction printer to a PC. That is until now, because the Linksys WPSM54G creates a two-way highway that works with multifunction printers. On the downside, it's expensive and *much* slower than using a USB cable.

The device, which Linksys has tested with about 80 popular MFPs, is a snap to install. By following the CD's illustrated instructions, you'll have a connected MFP in about 15 minutes. The software leaves behind a System Tray icon that shows its status, but the printer demands to be the default device. Although this is normal during installation, it defaulted to the original printer when I tried to change to another printer.

In addition to being compatible with all 802.11b/g networks, the WPSM54G is also compatible with many recent 802.11n routers. It supports all WEP and WPA protocols up to 128-bit encryption and works just as well with dynamic IP addressing as with a static address. Although it worked with a variety of Windows PCs, it's not for Macs or Linux PC.

In a week of daily use with four computers, the WPSM54G had an average range of 95 feet with a D-Link DI-624 router and Canon Pixma MP780 multifunction printer. Although the WPSM54G's software frequently warned that it was unable to connect with the printer, it worked nonetheless, and produced a two-page color Acrobat document in 1:51 (minutes:seconds), or 18% slower than when I established a connection via a USB cable. It's a real slowpoke when it comes to wirelessly sending a scan, however, taking 6:36 to turn a magazine cover into an image and deliver it to my system, compared to 30 seconds when I used a cable.

With the popularity of MFPs and wireless networks in homes and small offices, the WPSM54G is a must-have accessory that adds value to each by letting several computers wirelessly share a single printer. Too bad, because at $120, it costs more than many multifunction printers do. ▲

by Brian Nadel

WPSM54G
$119.99
Linksys
www.linksys.com
●●●●

Specs: 802.11b/g; Ports: USB, 10/100 Ethernet; 128-bit WPA-PSK encryption; Status LEDs

MSI K9AGM2-FIH

If you've been toying with the idea of putting a PC in your living room, now's not a bad time to be more serious about building that HTPC. MSI's new micro-ATX K9AGM2-FIH sports AMD's 690G chipset, which features an integrated ATI Radeon X1250 graphics chip. The board also includes an HDMI port, unlike the Asus M2A-VM we reviewed in the May 2007 issue. (See page 28.)

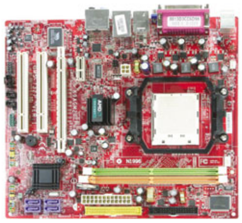
MSI packed a PCI-E x16 slot, a PCI-E x1 slot, and two legacy PCI slots onto the board. The AMD SB600 southbridge sits just behind them, as do the board's four SATA ports. The SATA ports (supporting RAID 0, 1, and 0+1) are directly behind the x16 slot, which means a long, dual-slot card like an 8800 GTX will block all four.

Two DIMM slots support a total of 4GB of DDR2-800 memory, which is half the maximum amount supported by the M2A-VM. But the K9AGM2-FIH's rear I/O area is much more exciting than the M2A-VM's. MSI's board boasts a FireWire 400 port (and an internal header for another, thanks to a VIA VT6308 controller) and an HDMI port, neither of which appear on Asus' board.

Other ports K9AGM2-FIH include four USB 2.0 ports, one Gigabit Ethernet port, and a VGA port. Unlike the M2A-VM, though, it doesn't have a DVI port.

The MSI K9AGM2-FIH and the Asus M2A-VM provided comparable performance in our benchmarks, so which board will grace your HTPC depends largely on which features are most important to you. I'm disappointed that the K9AGM2-FIH doesn't offer a DVI output and has only two memory slots, but the M2A-VM lacks an HDMI port and FireWire. I like the K9AGM2-FIH's other features more, so that's where I'd put my money. ▲

by Joshua Gulick



K9AGM2-FIH
$84.99
MSI
www.msicomputer.com
●●●●

Benchmark Numbers

	MSI K9AGM2-FIH	Asus M2A-VM	Asus M2NPV-VM
PCMark05	4053	4101	4293
CPU	5287	5214	5319
Memory	4247	4212	4232
Graphics	1523	1538	1367
HDD	6564	6928	2184
3DMark06	294	276	205
SM 2.0	134	126	94
CPU	1943	1935	1973
Dr. DivX*	6:16	6:14	6:09
WinRAR*	3:59	4:03	3:59

*(minutes:seconds)

Specs: Socket AM2; Chipset: AMD 690G / SB600; Memory: Dual-channel DDR2-800/667/553 (4GB max); Graphics: Radeon X1250; Ports: HDMI, 4 3Gbps SATA, 4 USB 2.0; 7.1 audio

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Intel Xeon X5365 & S5000XVNSAS

Eight Cores To Rev Your Engine

S5000XVNSAS
$550 to $600
Xeon X5365
Pricing not yet available
Intel
www.intel.com
●●●●

Like a lot of the folks here on Team *CPU*, I don't turn to workstations for leisurely pursuits: Given the choice, I'll take C&C 3 over AutoCAD any day of the week. But that doesn't mean impressive hardware intended for workstations and/or servers doesn't occasionally catch my eye.

That's exactly the case with Intel's platform consisting of two 3GHz, quad-core Xeon X5365 processors saddled to the S5000XVNSAS workstation motherboard. Intel nicknamed this beast "V8" at CES this year, and it's clear that this is a muscle car with horsepower to spare.

If eight cores aren't enough to whet your appetite, take a gander at some of this platform's combined specs: a 1,333MHz FSB, 8MB of L2 cache per processor, eight DIMM slots for up 32GB of FB-DIMM (Fully Buffered DIMM) memory, and an integrated SAS controller. You know what the QX6700 can do with its 8MB of L2 cache and 1,066MHz FSB; imagine the power you can wield with two X5365s.

The S5000XVNSAS' storage options are equally impressive. As its product name suggests, it sports an integrated SAS controller that lets you connect up to four wicked-fast SAS drives. The simple fact that you don't have to spend a few hundred dollars on a SAS controller card will help justify the board's $550+ price tag for power users in need of serious storage options. So if purchasing the board and a pair of processor's hasn't maxed your credit card, add two Raptor-devouring Seagate Cheetahs in a RAID 0. Each SAS connector also supports the "sluggish" 3Gbps SATA interface, and there are two other connectors devoted exclusively to SATA drives. (The S5000XVNSATA is void of the SAS controller.)

At first glance, the 667MHz FB-DIMM modules may seem nigh prehistoric compared to Corsair sticks that are running at twice that speed, but the folks in Santa Clara didn't just decide to make this move after an all-night bender the day before IDF. In the server world, reliability is king, and FB-DIMM technology offers extra memory channels that can mirror data, protecting it in the event of a module failure. According to Intel, it should also facilitate a smooth transition from DDR2 to DDR3, letting you swap old modules without need to scrap your motherboard for new memory slots.

Hardcore gamers will surely scoff at the single PEG slot, but again, this rig is built for creating games like Crysis, not playing them.

I combined the V8 platform with a 74GB Raptor hard drive and an Nvidia GeForce 7950 GX2 in an attempt to make it at least break a sweat on my suite of benchmarks. (I also used fully updated versions of Windows XP Pro and Nvidia graphic drivers.) Although the X5365 didn't appear to offer significant gains in tests such as PCMark05, 3DMark06 (except for the eye-popping 6205 CPU score), and WinRAR, it dominated any test involving multithreaded testing. If you don't believe me, compare its multithreaded Cinebench results to the X6800 rig on page 38.

In short, the V8 isn't for the faint of heart or light of wallet. (Plus, the X5365 hasn't even hit retail shelves yet.) It's not a desktop board, so don't expect to drop this engine in your ATX case. You'll pay a hefty ransom for this combo, but for anyone who's serious about content creation, the X5365 and S5000XVNSAS is a dream come true. ▲

by Vince Cogley

PCMark05	
Overall	8872
CPU	9546
Memory	5005
Graphics	7371
HDD	6543
3DMark06	
Overall	9438
SM 2.0	3624
HDR/SM 3.0	3438
CPU	6205
SiSoft SANDRA XI SP1	
Processor Arithmetic	
Dhrystone ALU	110,253Mips
Whetstone ALU	74,580MFlops
Processor Multimedia	
Integer x8 iSSSE3	661,823itps
Floating-Point x4 iSSSE2	356,088itps
Memory Bandwidth	
Integer Buffered iSSE2	4,078MBps
Floating-Point Buffered iSSSE2	4,079MBps
WinRAR 3.51	3:39*
POV-Ray 3.7 Beta20a	3376.4pps**
Dr. DivX	3:37*
Cinebench 9.5	
Single-threaded	:46*
Multithreaded	:10*

*(minutes:seconds) **pixels per second

Specs (S5000XVNSAS): Chipset: Intel 5000X; 1,333MHz FSB; Max memory: 32GB ECC FB-DIMMs; Ports: 4 SAS/SATA, 2 SATA, 2 Gigabit Ethernet, 4 USB; Slots: 1 PCI-E x16, 2 PCI-E x4, 1 PCI-X 100/133, 1 PCI-X 100
Specs (Xeon X5365): Socket FC-LGA6; 3GHz clock speed; 8MB L2 cache; TDP: 150W

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

by Anand Lal Shimpi

Understanding Why AMD Bought ATI

AMD spent a lot of money buying ATI, and over the past year there has been a lot of talk about Intel's mysterious Larrabee project, allegedly its first high-performance GPU architecture. Why on earth are the two biggest CPU makers, designers of some extremely complicated microprocessor architectures, so interested in graphics cards mostly used for gaming?

AMD has already announced its first Fusion microprocessor, due out sometime in 2008 or 2009, and it will basically be a GPU and CPU on a single package. The GPU won't be terribly powerful; it'll most likely be a bit more powerful than most integrated graphics solutions that you find on chipsets today. So why bother? It's not about a smaller form factor integrated graphics solution. In fact, it's not about graphics at all; Fusion and future hybrid CPU/GPU solutions are all about general processing power.

In the early days of 3dfx, 3D accelerators had one purpose and one purpose alone: to make 3D games look better and run faster. These days, however, GPUs are general-purpose enough to actually tackle a wider variety of applications, and because of their highly parallel architecture they can do certain things very well.

Take H.264 decode acceleration for example; Nvidia's GeForce 8600 launched with full H.264 decode acceleration, and the most strenuous H.264-encoded HD DVD movie I use for testing averages around 20% CPU utilization in a PC equipped with an 8600. If you took the 8600 out of the system and left decoding up to the Intel Core 2 Duo, you'd see 80 to 100% CPU usage. Not only does the 8600 handle H.264 decoding better than Core 2 Duo, but it does so with greater power efficiency. The 8600 is even operating at a disadvantage; Intel uses its own fine-tuned 65nm process to produce the Core 2 Duo, while Nvidia relies on TSMC's general 80nm process. If Intel built the 8600, the performance per watt disparity would be even greater.

The point isn't that the 8600 is a superior processor. After all, if you compiled Firefox to run on it the chips' roles would be reversed. No, the point is that for certain applications, a highly parallel programmable microprocessor is superior to the mostly sequential processors that AMD and Intel make for the desktop. The 8600 or any other GPU would do a terrible job at the tasks modern-day desktop CPUs are good at, and I've just shown that these CPUs are hardly efficient at things GPUs do very well, so why not combine the two?

The problem is that conceptually, we're trained to think of the CPU and GPU as independent processors, and furthermore we're used to talking about multicore processors in a homogenous sense. If you look at an Intel Core 2 Quad processor, it features four identical cores, whereas Intel's current quad-core parts simply have two dual-core dies on a single package. But the future of multicore CPUs isn't simply doubling the number of cores we stick on a single package every couple years, if we did that we'd run into the same power limitations that we did in the GHz race a couple of years back. The multicore CPUs of the next generation will be composed of various different cores, each with their own strengths, designed to offer the best overall performance for any sort of application.

You can envision a mainstream multicore CPU with a pair of high-performance x86 cores and a third core that's built very much like a GPU—highly parallel and not very good at sequential processing but great at handling streams of lots of data. Put all three cores behind a shared cache and put some dispatch hardware at the front of all of them to send the right instructions to the right cores, and you've got a heterogeneous multicore CPU; you also happen to have the fu-ture of CPU/GPU integration.

Again, it's not about taking integrated graphics to the next level, it's about the processing power of a highly parallel stream processor like the GPU, and as more of our apps require that sort of power it will make more sense to integrate that sort of functionality into our CPUs. Video decoding is a great example today, because requiring eight-core CPUs to play HD DVD/Blu-ray movies isn't practical, but future applications such as face recognition, real-time video transcoding, and physics all stand to benefit from these two processing powerhouses colliding. ▲

Talk back to Anand at anand@cpumag.com.

Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today*, CBS' "48 Hours" and* Fortune*. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.*

It's not about a smaller form factor integrated graphics solution. In fact, it's not about graphics at all.

The Shark Tank

by Alex "Sharky" Ross

ATI Unveils R600

So far in 2007 it's been all Nvidia as far as the GPU world is concerned. ATI may have merged with AMD, but its next-generation part that was designed to go up against Nvidia's G80 (GeForce 8 series) was nowhere to be seen. Merger or not, some things never change. ATI is late. Very late. However, at press time ATI has finally taken the wraps off of its next-generation DirectX 10 GPU, the R600.

The entire line-up consists of 10 (there is a theme obviously) products ranging from entry level to high-end. The only part that will actually be available by the time you read this is the Radeon HD 2900XT, which will be targeting Nvidia's GeForce 8800 GTS. The AMD ownership of ATI has obviously decided to concede the "3D graphics king" title at the uber-high end (and low production) to the likes of Nvidia's Geforce 8800 GTX and Ultra. This is somewhat disappointing, and it's the first time I can remember anyone throwing in the towel like that. Historically, whether it was DirectX 5, 6, 7, 8, or 9, 3D graphics companies always duked it out with each other, aiming for the very top in terms of performance and often pushing each other to the limits of their technologies. So there you have it. If you want the absolute fastest gaming GPU, then you're still going to need a GeForce 8800 Ultra (released a few weeks ago). With that out of the way, it's easy to see why ATI is targeting the more mainstream 8800 GTS. After all, this is where the real money is made.

The Radeon HD 2900XT sports 700+ million transistors and is manufactured on an enhanced version of TSMC's 80nm node known as "80HS." The 80HS is important to ATI, as the company claimed it was able to turn the frequency dial to levels that were unattainable with the regular 80nm process. Taking a page out of Nvidia's book, the R600 architecture is no longer made up of dedicated pixel and vertex shaders. Instead, the R600 is made up of an array of stream processors that can dynamically handle pixel or vertex shader operations, geometry shaders, and/or physics. A unified shader architecture is certainly more efficient since it can perform dynamic load balancing and prioritize whether pixel, vertex, or geometry shaders are most needed in a particular scene. The R600 differs from G80, being more parallel, running at lower clock speeds, and running 320 stream processors at 724MHz, as opposed to the G80's 128 but faster and scalar stream processors. The technology itself is largely brought over from the Xbox 360's Xenos and also carried over from the Radeon X1000 series along with a lot of new goodies (I'm sure we'll see the likes of it in upcoming issues) all designed to take on DirectX 10 and Shader Model 4.0.

The board itself features an external 512-bit memory interface sporting eight 64-bit memory channels. With 512MB of GDDR3 running at 800MHz, memory bandwidth is quite impressive at a theoretical max of 106GBps. The ring-bus memory controller introduced on the X1000 series is carried over, but for the HD 2900 the ring bus width has been widened to 1Kb. There are 16 total texture units and ROPs, and although that number is unchanged from the previous high-end X1950 XTX, enhancements have been made to increase precision and performance. As you would expect with ATI, its new Avivo HD is top of the class. The performance of the HD 2900 XT is on par with a GeForce 8800 GTS in almost any game and that is no mean achievement. The image quality is right up there, as well. There have already been some concerns about power consumption being too high, and overall the whole release just isn't very exciting, is it? The technology is a nice leap for ATI/AMD, which now gets DX10 compliance, but for the hardcore gamer it's a case of "move along . . . nothing to see here . . . move along." ▲

Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overclocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he's not tweaking PCs.

As you would expect with ATI, its new AVIVO HD is top of the class.

Email me at sharky@cpumag.com

PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

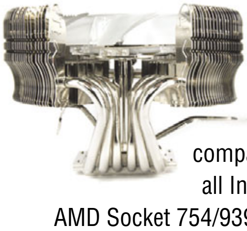
Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community.

Mods & Ends

Thermaltake MaxOrb

If you're in the market for a powerful—yet nearly silent—air cooler that will keep CPU temperatures in check while overclocking, do yourself a favor and check out Thermaltake's new MaxOrb ($50). This massive piece of hardware sports six heatpipes that connect to a nickel-plated copper base and snake though a radial array of densely packed fins. The dense array of heatsink fins offers a large amount of surface area for rapid heat dissipation. A large, 12cm fan generates 16 to 24dB of noise and blows air over the cooler's base and through the heatsink fins for maximum cooling.

The Thermaltake MaxOrb is compatible with all Intel Socket 775 and AMD Socket 754/939/AM2 processors, and an innovative push-pin clip design means users won't have to remove their motherboard to install this cooler, despite its relatively large size. (We don't know of any northbridge coolers that would cause problems with the MaxOrb, but it's always a possibility.) The MaxOrb also features a handy fan speed control knob on its side for users who want to alternate between near-silent operation and maximum performance.



The massive Thermaltake MaxOrb cooler is compatible with virtually all Intel Socket 775 and AMD Socket 754/939/AM2 processors.

Silverstone Strider ST1000

PC power problems may be a thing of the past with Silverstone's new Strider SST-ST1000 PSU. As its name implies, the Strider ST1000 ($249) is capable of supplying 1kW of continuous power, but the unit's specifications also claim an impressive peak output of 1.1kW.

Unlike most other modular PSUs that have their main ATX power cables internally hardwired, the ST1000 features a 100% modular design: You can disconnect every cable from the unit. The ST1000 can supply 35A of current on each of its two +12V rails. The unit includes four 6-pin PCI-E and two 8-pin PCI-E 2.0 power connectors to accommodate almost any type of graphics card configuration. A large, 13.5cm fan keeps the PSU's internal components cool and puts out only 22dB of noise. Other features of the ST1000 include Active PFC and an advertised efficiency rating of over 80%.

Silverstone's new Strider ST1000 1kW PSU can supply 35 amps on each of its +12V rails.

Enzotech CNB-R1

Overclockers know that keeping a motherboard's northbridge chip cool is essential for maintaining stability at high bus speeds and voltages. To aid in the battle against overheating northbridge chips, Enzotech has designed a one-piece, forged copper heatsink dubbed the CNB-R1 ($23). Although the unit appears to be relatively small, it weighs in at a hefty 4.2 ounces, and the heatsink's pin-like fins offer plenty of surface area to dissipate heat. Because the CNB-R1 is a solid piece of metal with no interface or gaps, heat won't be trapped in miniscule air pockets, which further enhances the CNB-R1's cooling ability. The CNB-R1 can be used as a passive cooler, but direct some airflow over the heatsink with a case fan and you'll have one serious northbridge cooling combination in your rig.

The Enzotech CNB-R1 is a one-piece, forged copper northbridge heatsink that weighs in at a beefy 4.2 ounces.

Fashionably Fresh Firmware

Canon EOS Digital Rebel XTi (v1.05)

Updated firmware for the Canon EOS Digital rebel XTi fixes an issue with printing lens names when using PictBridge and lets users select Red-Eye 1 when connecting the camera to some printers. The firmware also improves communication reliability with the Speedlite 380EX.

www.canon.com

Plextor PX-755SA (v1.07)

A recent firmware update for Plextor's PX-755SA burner improves interchangeability when the drive is connected to a SATA controller or SATA/USB converter.

www.plextor.com

Sigma SD14 Digital SLR (v1.01)

Sigma has released updated firmware for their SD14 digital SLI camera that improves image quality when viewing pictures on the unit's LCD. It also fixes compatibility problems with certain types of CF media and enables sensor cleaning on battery power, among numerous other fixes.

www.sigma-sd14.com

by Marco Chiappetta

AQ5 Antec Quality 5 Year Warranty

TRUE**POWER** TRIO
430W/550W/650W

Meet Ed. He's the king of Gigabit switches and terabytes of storage. Ed needs stable, reliable, and efficient power supplies. TruePower Trio's tight ±3% power regulation is easy on his equipment and cool-running power supplies don't overheat his hairdo.

- Three +12V rails power high-end CPUs, video cards, and RAID arrays
- Up to 85% efficiency saves money and generates less heat
- A 5 year warranty

Ed is a serious user, with serious power requirements, but most of all he needs the quiet provided by the Trio's 120mm low noise cooling fan. That’s why he relies only on Antec to power the server farm he has set up in his mom’s basement.

Antec®
The Power of You

Found out more about TruePower Trio power supplies at **www.antec.com**.

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Core 2 Duo E4300 Overclocking

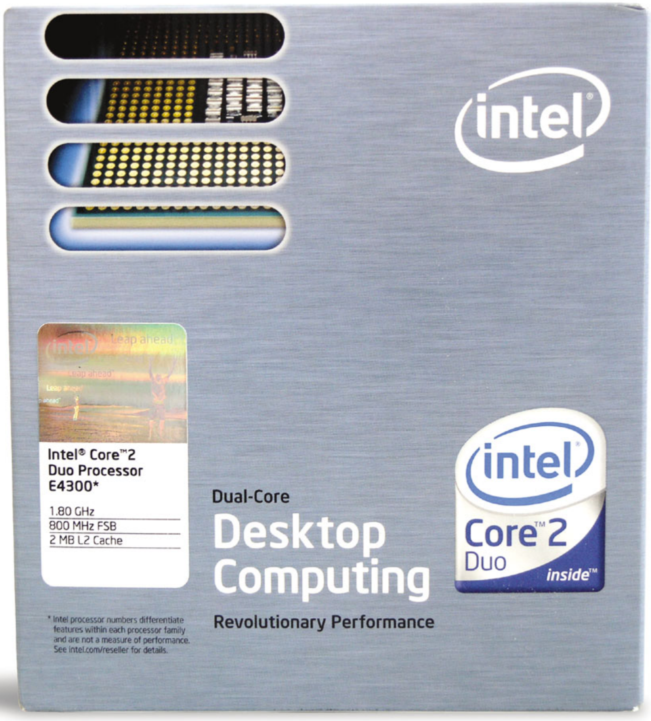
Extreme Bang For The Buck

There are two types of PC enthusiasts—those who have nearly unlimited budgets and can purchase bleeding-edge hardware the moment it's released, and the rest of us who have to make due with more affordable mainstream products.

Luckily, the way many PC components are manufactured means budget-constrained enthusiasts usually don't have to sacrifice much in terms of features. Sure, mainstream motherboards don't have all of the bells and whistles of high-end products, but they will perform many of the same functions. And today's graphics cards and processors have all of the same features and do all of the same things. A GeForce 8500 GT, for example, can theoretically do everything the GeForce 8800 Ultra can. The only differences are that varying amounts of onboard memory and pixel pipeline/shader configurations limit the performance of lesser hardware.

The scalable nature of today's CPUs and graphics cards also means that products in the same family typically share a common architecture; they are just selectively binned and sold at different prices. This means that it's usually possible to buy a more affordable product in a particular lineup and tweak or modify it to perform at much higher performance levels. This is the case with the the Core 2 Duo E4300, the processor we're going to modify for this month's project.

At the time of this writing, the 1.8GHz Core 2 Duo E4300 is the least expensive dual-core processor in Intel's product stack that's based on the Core microarchitecture introduced with Conroe. It's based on the Allendale core, which is basically the same as Conroe but with half the amount of L2 cache. (Allendale has 2MB total L2 cache; Conroe has 4MB.) The Allendale-based E4x00 series processor also features an 800MHz FSB frequency (200MHz quad-pumped), whereas Conroe-based E6x00 processors feature a 1,066MHz FSB (266MHz quad-pumped). We picked up an E4300 for $115.


intel
Intel® Core™2 Duo Processor E4300*
1.80 GHz
800 MHz FSB
2 MB L2 Cache
Dual-Core
Desktop Computing
Revolutionary Performance
intel
Core™2 Duo
inside™
* Intel processor numbers differentiate features within each processor family and are not a measure of performance. See intel.com/reseller for details.

Parts Shopping

The fact that the Core 2 Duo E4300 has a relatively low FSB speed makes it a great candidate for an overclocking mod. To arrive at its factory clock speed of 1.8GHz, the processor requires a 9X multiplier (9 x 200MHz = 1.8GHz). That's the same multiplier as the 2.4GHz Core 2 Duo E6600, but the E6600's faster FSB results in a higher final clock speed.

Now, there is never a guarantee that a particular CPU will overclock. But given what we know about processor manufacturing and the overclockability of Core 2 Duo processors, there's a good likelihood that a CPU such as the Core 2 Duo E4300 will have plenty of headroom. By simply increasing the FSB to 1,066MHz, it should perform similarly to the E6600 while the rest of the system components remain within spec. Every Core 2-compatible motherboard is required to run at a 1,066MHz FSB, so even though we'll be overclocking the E4300 by increasing the FSB 1,066MHz, none of the other components in the system will be. This also means that severely budget-constrained enthusiasts can get by with basic RAM and a motherboard with only rudimentary overclocking options, although we still recommend splurging a bit on these two components. Good RAM and a quality

At only 1.8GHz, Intel's Core 2 Duo E4300 is the lowest clocked and least expensive member of the Core 2 Duo processor family.

mobo are paramount to a long lasting and stable system.

This brings us to the motherboard we'll be using for this project, the Evga nForce 680i LT SLI (model 122-CK-NF67-A1). Although hitting a 1,066MHz FSB and the resulting 600MHz core CPU overclock would be nothing to sneeze at, we wanted to see just how far we could push the E4300 using a high-end air cooler. To do this, we needed a motherboard that would be capable of hitting high FSB speeds that also gave us good control over the processor's voltage. We didn't want to spring for an expensive, top-of-the-line board, so Evga's board—$165 after rebates—fit our budget nicely.

To cool the processor, however, we splurged a bit. In fact, the cooler we used is more expensive than the processor itself. It's a universal cooler that can be used with any of today's common CPU sockets and has some unique features that somewhat justify its price. We're talking about the Ultra ChillTec, reviewed in this issue. (See "Thermoelectric Coolers" on page 70.) For $129, the ChillTec offers a massive, TEC-enhanced, tower-type heatsink and, as our test showed, was more than capable of keeping an overclocked Core 2 Extreme QX6700 up and running; the E4300 should be no match.

So if you have been keeping track of our costs, the processor, motherboard, and aftermarket cooler put our running total at about $433. These components combined were less expensive than the Core 2 Extreme X6800 processor alone. Keep that in mind when you inspect the performance sidebar.

Put It All Together

Before assembling the system, we modded all of the major components using some of the techniques we've discussed in the past. We polished the CPU's heat spreader and primed it with a high-quality thermal paste, doing the same for the ChillTec cooler's base. We also removed the Evga motherboard's northbridge and southbridge coolers, cleaned them up, and applied quality thermal paste to them, as well. For the most part, system assembly was straightforward, but we did have to take a few extra steps to install the ChillTec. It required us to mount a plate to the backside of the motherboard and use a little bit of extra wiring to supply power to its thermoelectric cooler.

Born To Crank

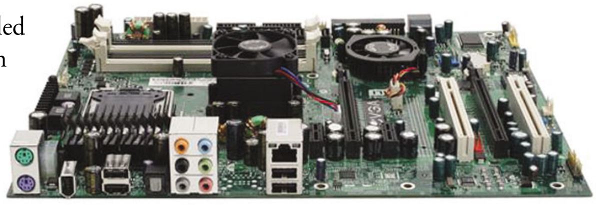
Once everything was assembled and we were certain the system was functioning properly, we began the overclocking process. We recommend you do some stability testing before modding any components to be sure you're not working with any lemons.

When a system is overclocked too far, it will almost certainly be unstable, and diagnosing the problem will be incredibly frustrating if you find out one of the components was bad to start with.

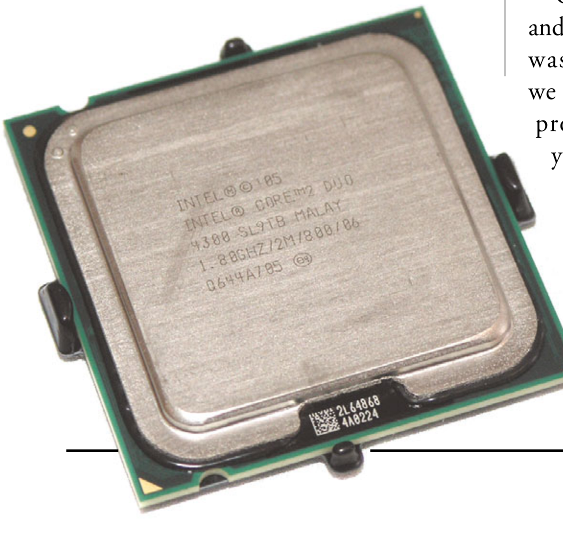
We began by entering the motherboard's system BIOS and raising the FSB from its default speed of 800MHz to 1,066MHz. This resulted in a 2.4GHz CPU frequency. At this setting, our E4300 processor exhibited no instability and ran at about 52 degrees Celsius under load, so we ventured onward. We increased the FSB in 10MHz increments, testing for stability between each step.

When the FSB hit 1,156MHz, our system booted into Windows without any trouble, but applications would crash to the desktop under load. The processor's temperature hadn't risen above 60 C, so we were confident that heat wasn't an issue. We wanted to find the processor's max stable frequency at stock settings before unnecessarily increasing the voltage. So at this point, we entered the system BIOS and altered the processor's voltage.

In the BIOS, we tacked on an additional .1V (1.45V up from 1.35V) and again proceeded to crank up the FSB. In the end, we were able to raise the FSB from its default speed of 800MHz up to 1,316MHz for a final CPU clock speed of 2.96GHz. At these settings, the CPU ran at about 70 C after an extended period under load, which was about as high as we were willing to go with the ChillTec cooler. Once processor temperatures approach the 80 C mark, the CPU tends



Evga's nForce 680i LT SLI motherboard is known to overclock to very high FSB frequencies and is available for less than $200.



The Core 2 Duo E4300 is based upon the Allendale core, which is similar to Conroe but equipped with only 2MB of L2 cache and utilizes an 800MHz FSB frequency.

to throttle back performance to maintain stability; even though it may look like you've hit a higher CPU frequency, your performance won't scale to match the purported frequency.

The Reward

By choosing the right components, spending some time modding components, and tweaking clock speeds, we were able to take a $115 CPU and make it perform better than its $1,000 counterpart. Of course, with any overclocking project, your results may differ. But considering how inexpensive Intel's E4x00 Core 2 Duo processors have become, they're excellent candidates for just such a mod. ▲

by Marco Chiappetta

The Ultra ChillTec thermoelectric cooler we used for this project absolutely dwarfs the stock Intel PIB heatsink.

Performance:
Before & After the Mod

To determine how much faster our modded and overclocked Core 2 Duo E4300 processor was over its default configuration and to assess how the modded setup performed compared to Intel's current flagship dual-core Core 2 Extreme X6800 processor, we ran a number of popular synthetic and real-world application benchmarks on our test rigs. In addition to the Evga nForce 680i LT motherboard we mentioned earlier, the systems were outfitted with 2GB of Corsair Dominator TWIN2X2048-8500C5 RAM and a single GeForce 8800 GTX.

In addition to a 1.1GHz clock speed disparity at default settings, the Core 2 Duo E4300 has only half of the L2 cache of the Core 2 Extreme X6800 and a 266MHz lower effective front side bus frequency (800MHz vs. 1,066MHz). These three factors are the reasons that a stock E4300's performance is so much lower than the high-end X6800 processor. But by manipulating the FSB and overclocking the E4300, we can overcome two of these disadvantages. (No amount of tweaking will change the fact that the CPU has only 2MB of L2 cache.)

Surprisingly, the E4300's smaller cache had a minimal impact on performance in most of the benchmarks we ran. After modding our rig and cranking the processor's clock speed up to almost 3GHz, its performance increased substantially—so much so that the overclocked rig matched or outperformed the more expensive Core 2 Extreme X6800 in 12 of 13 benchmarks. The modded system's slightly higher core clock speed in conjunction with its higher clocked memory and FSB give it the edge in all of the tests that are bound by the processors raw compute performance and the amount of available memory bandwidth. In the only benchmark where the Core 2 Extreme X6800 came out on top—the low-resolution F.E.A.R. test—the flagship processor's larger cache comes into play and it surges ahead. ▲

	Core 2 Duo E4300 at 1.8GHz	Core 2 Duo E4300 at 2.96GHz	Core 2 Extreme X6800 at 2.93GHz
Front Side Bus Frequency	800MHz	1,316MHz	1,066MHz
Memory Frequency	800MHz	987MHz	800MHz
FSB:Memory Ratio	1:1	4:3	5:4
SiSoft SANDRA XI SP1			
Processor Arithmetic			
Dhrystone ALU	16,568Mips	27,274Mips	27,060Mips
Whetstone iSSE3	11,238MFlops	18,439MFlops	18,146MFlops
Processor Multimedia			
Integer x4 aEMMX/aSSE	98,908itps	162,791itps	161,396itps
Floating-Point x4 iSSE2	53,845itps	88,709itps	87,918itps
Memory Bandwidth			
Integer Buffered iSSE2	4,354MBps	6,873MBps	5,787MBps
Floating-Point Buffered iSSE	24,455MBps	6,873MBps	5,815MBps
LAME MT MP3 Encoding (minutes:seconds)			
Single-threaded	1:15	:46	:47
Multithreaded	:47	:28	:29
Cinebench 9.5 (minutes:seconds)			
Single-threaded	1:14	:45	:45
Multithreaded	:40	:24	:24
KribiBench 1.1			
Sponge Explode Model	3.75fps	6.21fps	6.01fps
Ultra Model	1.21fps	1.99fps	1.95fps
F.E.A.R. 1.08			
Low-resolution CPU test (800 x 600, low quality)	139fps	232fps	244fps

** All benchmarks were run on Windows XP Professional SP2*

Mad Reader MOD

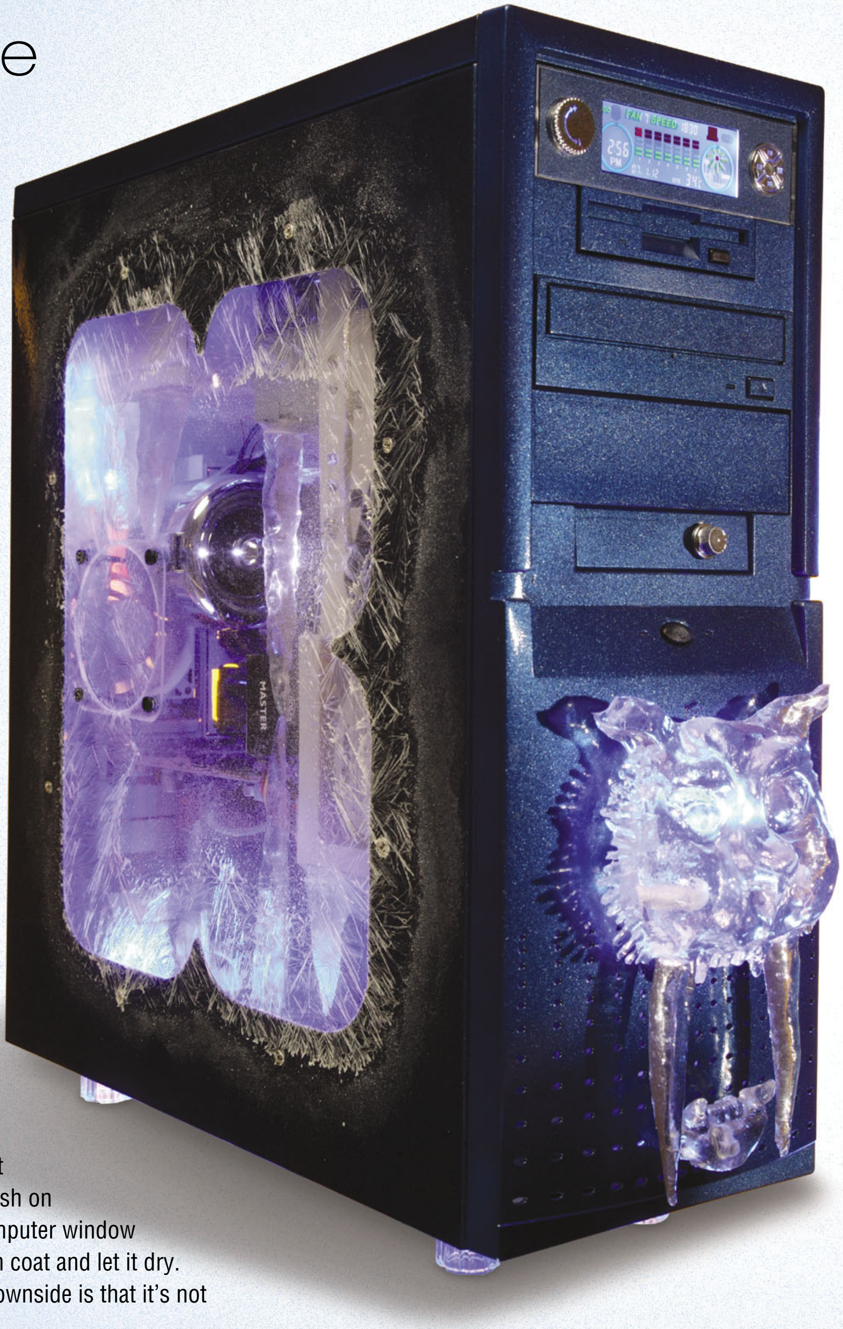
This Is Your PC On Ice

Forget cool: From the frosted window to the saber-toothed tiger that adorns its front panel, this case is positively frigid. "I had a lot of fun trying to keep the theme throughout the case," says Brian "Booman" McCracken, who spent three months transforming a Gateway case that he found at a garage sale. "I tried to relate everything to white colors or something relating to cold temperatures.

"I wanted to add some sculptural elements to enhance the bezel and chassis," McCracken adds. "I also wanted to show that any case can be modded into a brand new case with lots of eye candy without having to buy new hardware." The sculptural eye candy takes the form of several faux-icicles and the saber-toothed tiger head. McCracken built these pieces by first forming them from clay. He covered each piece with latex and then plaster, which dried to form a mold. At this point, he was able pour a clear epoxy resin into the mold.

Once McCracken peeled off the molds, he had the icy-clear artwork he was looking for, but the modder took it one step further. "I had to cut a small hole in the bezel and weave one of those spotlights through to shine inside the saber-toothed tiger head," McCracken says. "The light is so bright that it actually lights up a dark room all by itself." McCracken finished off the frosty effects with blue LEDs in the case that shine onto the icicles. ▲

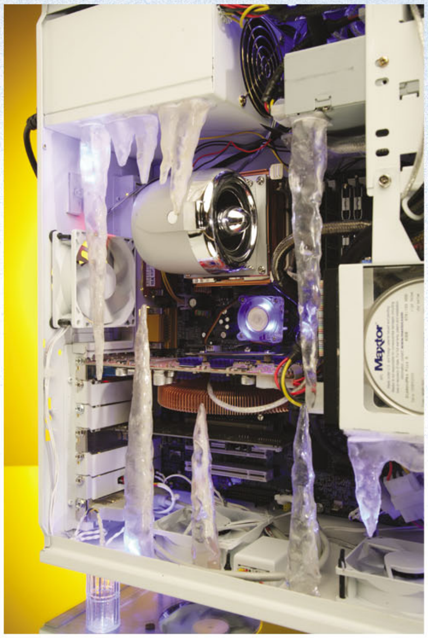
by Joshua Gulick



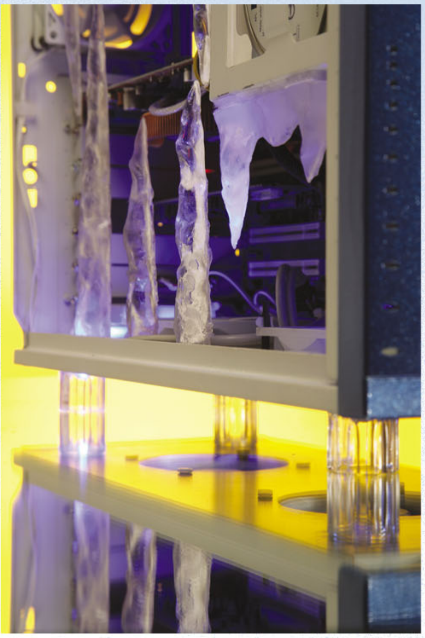
McCracken is pleased with the side panel window's frosty coating. "That is a special glass spray I found at a craft store," McCracken says. "It's meant to make a crystalline finish on glass jars. So I thought it would make a great touch on a computer window for a frozen-looking case. All you do is spray it on as one thin coat and let it dry. The spray creates the crystalline look all by itself. The only downside is that it's not permanent, it can be scratched off with a fingernail."

Give Us Your Mod

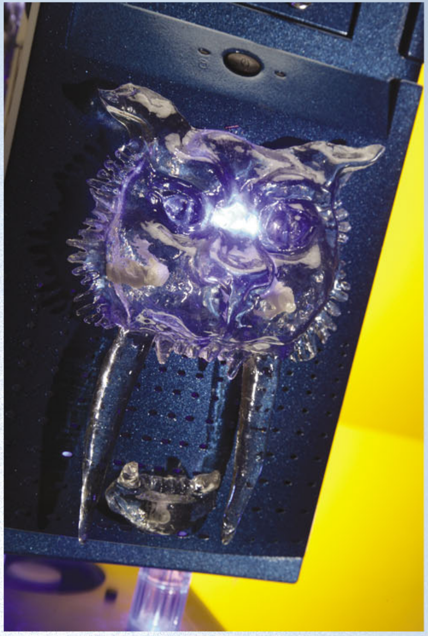
Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. We're looking for rigs that are recognizable as PCs; your Wookiee mod won't find a home here. If we include your system in our "Mad Reader Mod" section, we'll help you load up your modder's toolbox with $1,500 and a one-year subscription to *CPU*.



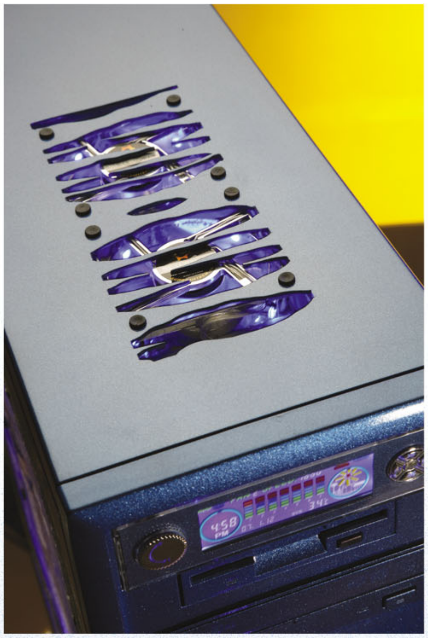
“At first I thought there wasn’t a way to paint fans because the spray paint would easily spray into the sleeve and coils, but I found that if I used some strips of foam and pressed them into the open area, they would make a great masking tool,” says McCracken. “It’s worked so far, none of the fans have stopped working.”



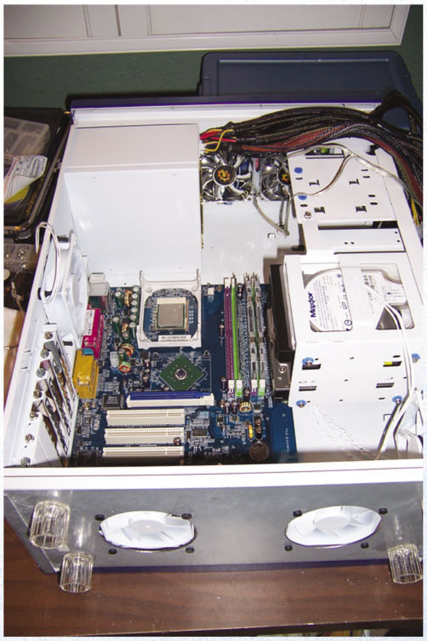
McCracken skipped his original plan (to light the system’s interior via blue LED fans) in favor of mini spotlight LEDs that he can direct onto the icicles.



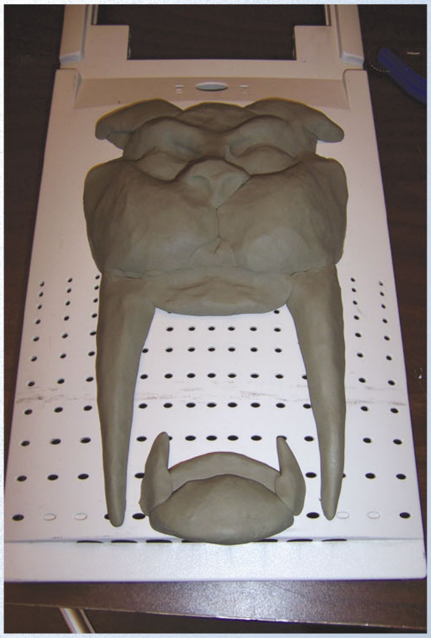
Thanks to an LED embedded in the tiger’s head, you can see the beast in dark environments. “Since the saber-toothed tiger is clear epoxy, it absorbs all the light and glows,” says McCracken.



“I tried to think up a way to make a fan grille that wouldn’t take away from the eye candy,” says McCracken. “So I started cutting away at the top panel and tried to make it appear like stalagmites and stalactites from an ice cave.”



McCracken used an 83mm punch bit to cut the holes for the intake fans at the bottom of the system. He burned out a drill in the process.



This photo shows the original clay mold of the saber-toothed tiger. McCracken used this to create the cast that he later poured the epoxy into.

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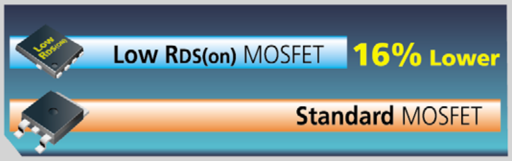

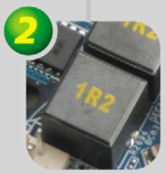

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Ferrite Core Choke Design

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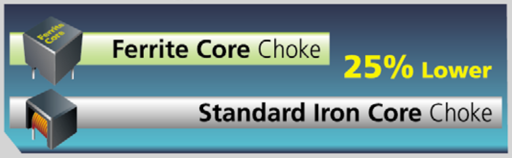
Core Energy Loss



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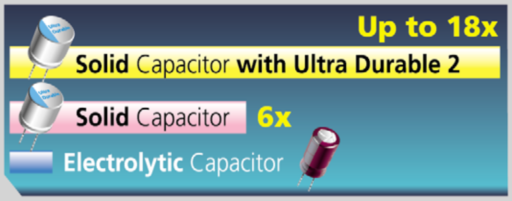

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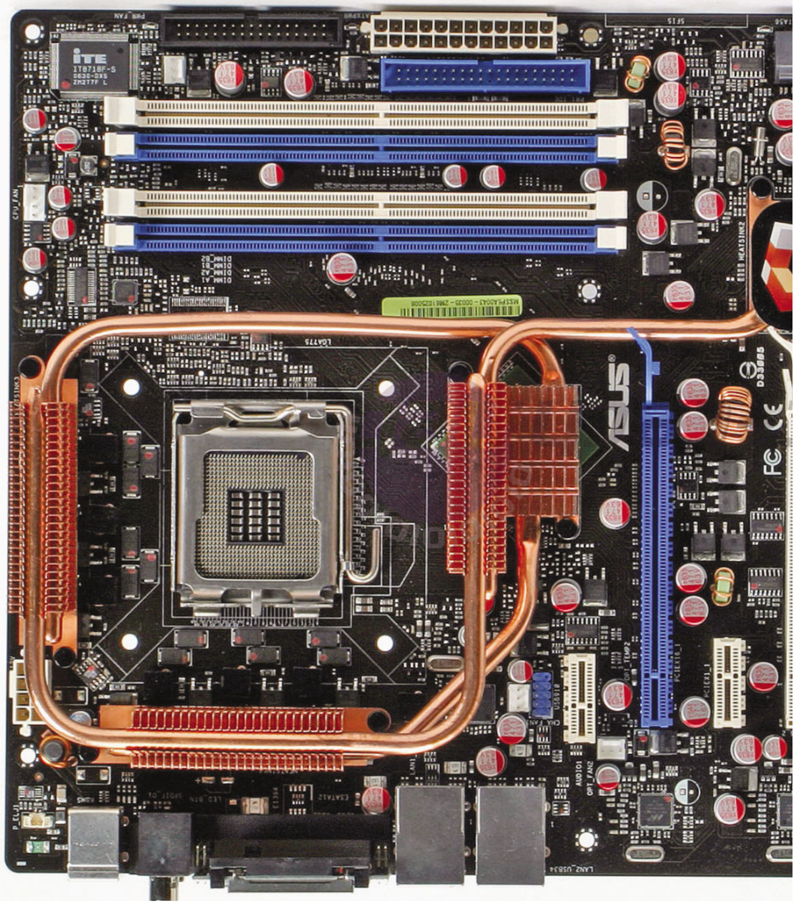
> “You may want to perform the BIOS update with only two matched DIMMs installed as a preventative measure, however. You don’t want the system hard-locking during a BIOS update.”

Each month we dig deep into the mailbag here at CPU *in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable?* CPU*’s “Advanced Q&A Corner” is here for you.*

D.J. asked: I have two 2GB sets of Corsair XMS2 RAM. One set is rated for PC2-6400 and the other for PC2-8500. I don’t have the money to buy another 2GB PC2-8500 kit, so I just installed them both in my machine for now. I know that the speed will be limited to 800MHz, which is the speed of the slowest kit, but for now that’s what I have to do to have 4GB of RAM. My problem is that when Windows Vista boots up it almost always freezes. The one time I did get Windows to boot properly it only recognized 2GB and not the whole 4GB. I rebooted and checked the BIOS and it said all 4GB was available, but when I tried to get back into Windows the system

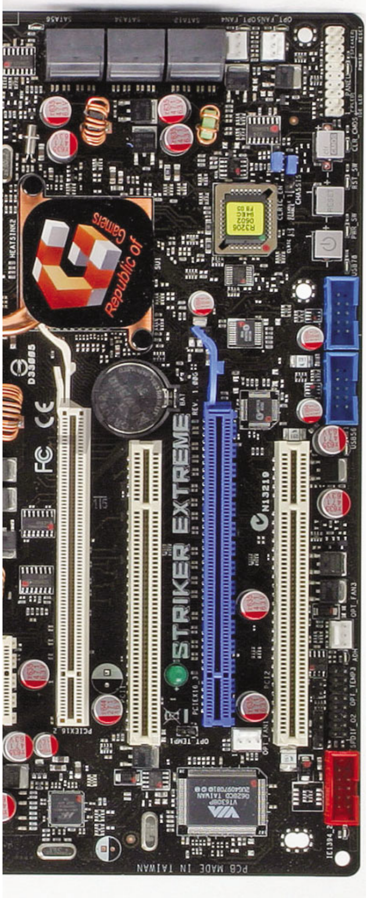


Asus’ nForce 680i SLI based Striker Extreme motherboard can be finicky when all four DIMM slots are loaded with unmatched memory kits.

froze again. Is there something in Vista that won't let me upgrade RAM? Most of the time it gives me a blue screen with a physical memory dump message and shows a bunch of numbers. I am running Vista Ultimate with an Intel QX6700, a pair of Raptor 150GB drives in RAID 0, two Evga 8800 GTX cards, and an Asus Striker Extreme motherboard.

A: There are a number of things that could be happening on your machine causing these errors, including an improperly configured BIOS, incorrectly installed memory, or even bad DIMMs. The first thing I suggest you do is ensure your memory is installed in matched pairs. Install both of your PC2-6400 sticks into the blue slots on the Striker motherboard and both PC2-8500 sticks into the white slots. If you mate a PC2-6400 DIMM with a PC2-8500 DIMM in dual-channel mode that could cause a problem. I also suggest updating your system BIOS. BIOS revisions 901 and newer for the Striker Extreme incorporate compatibility fixes for some different RAM types. You may want to perform the BIOS update with only two matched DIMMs installed as a preventative measure, however. You don't want the system hard-locking during a BIOS update. Once the BIOS update is done and you're sure the memory is installed correctly, enter the BIOS and manually set the timings and voltage; don't leave the memory configuration menus set to 'Auto.' Set the timings to match the slower of the two kits (likely 5-5-5-18-2T) and set the voltage to match the higher of the two kits. If there is a big disparity in voltage between the two, for example let's say one kit only requires 1.8V and the other 2.4V, try a voltage somewhere in between. The PC2-800 kit should be able to tolerate a somewhat higher voltage, and because the PC2-8500 kit is running at "only" 800MHz, a somewhat lower voltage should work for it, as well.

I'd also suggest running Memtest86 to check for errors. It's possible one (or more) of the four sticks of RAM in your system are defective. Run Memtest with only two sticks installed at a time to see if they pass the diagnostic. If memtest reports that all is well, and you're confident the system is configured properly and you're still having problems, you may need to relax the timings even further to stabilize the system. Good luck.



Gabe C. asked: My machine has been acting a little squirrelly lately. I think it may be infected with a virus or something but all of the scans I have done come up clean. Over the past few weeks, it feels like the computer has gotten slower and slower, so the other day I tried to uninstall some stuff and defrag the hard drive. The defrag started, but it never finished. My hard drive activity light was blinking so fast it almost looked like it never shut off. And then, when I canceled the defrag and restarted the computer, I noticed that my hard drive activity light was blinking like crazy even when I was not doing anything on the system. Any clue as to what's going on here? My computer shouldn't feel this slow, it's a Pentium D 915 with 2GB of RAM, a 500GB hard drive, and WinXP Pro.

A: It sounds like you've got something running in the background on your system that's hogging resources and bogging down the machine. It could also be that WinXP's built-in indexing feature, which presumably helps speed up searches, isn't functioning properly and is causing your hard drive to thrash constantly. I disable the indexing service anytime I set up an XP machine to prevent unwanted hard drive activity and to free up a bit of memory, and suggest that you do that same. Click your Start button, go to Run, and in the Open field, type **services.msc** and press ENTER. When the Services menu opens, scroll down to the Indexing Service, then right-click it and select Properties from the menu. In the resulting window that opens, click the General tab, and in the Startup Type drop-down menu select Disabled. Then click Apply, click OK to close that window, and then close the Services menu altogether. That'll take care of the indexing service.

Next, I'd recommend scanning your system for unwanted adware or spyware and deleting any junk files from the hard drive. There are a number of free online tools available to do this. I'd recommend trying a minimum of two tools to scan for spyware, because one application will usually find some files the other missed. AVG Anti-Spyware Free and AdAware Personal Edition are two popular tools. Download and install both of these and run their built-in update tools to ensure they are up-to-date with the most recent definition files. I also recommend downloading CCleaner to easily delete all junk files from your drive.

Once you have the spyware scanners and CCleaner installed, first run CCleaner, let it analyze your drive, and delete all of the files you're comfortable removing (letting it deleting everything it finds has never caused me any trouble). When that's done, restart your machine, boot into Safe Mode, log in as the Administrator, and run the spyware scans. I recommend running the scans from within Safe Mode because no background applications will launch that could potentially interfere with the scans. Delete any of the threats found by spyware scanners and restart your system normally. When WinXP fully boots, as a final precaution before defragging, run a scan on the drive to check for errors (right-click the drive in My Computer, select Properties from the menu, click the Tools tab, then click Check Now in the Error Checking menu) and configure the scan to automatically fix any errors. When that scan is complete, go ahead and defrag your drive. The combination of cleaning up any unwanted files, fixing errors, disabling the indexing service, removing spyware, and defragging the drive should speed up your system considerably. ▲

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by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

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WokFi

It's Not Just For Dinner Anymore

Next time you want to boost a wireless signal, you *could* go to your local electronics store. You *could* shop the Internet for a satellite dish or antenna. Or, better yet, you could go into your kitchen, find a metal strainer or wok, and make your own device.

The idea of the WokFi—a parabolic reflector device that uses a wok and USB Wi-Fi adapter to strengthen a Wi-Fi signal—has been around for a few years. Some people even used metal cans to boost a wireless signal before that.

But the wok device received renewed attention in the early part of 2007 when a volunteer at a startup New Zealand television station in Oamaru used a wok to create a makeshift antenna for the station, rather than spend several thousand dollars on a direct link between the station and the standard TV antenna. The wok device beams the signal to a dish antenna south of Oamaru, and the standard TV antenna then beams the signal to the town.

Stan Swan, a New Zealand educator and Wi-Fi enthusiast, has created the premier Web site devoted to information on creating a WokFi. Swan, who now calls himself "semi-retired" after decades of teaching technical and scientific education at Massey University (New Zealand's largest university), outlines his experiments with WokFi at his Web site.

"My slant has become very 'can do' in recent decades, somewhat to inspire youngsters who see no money in future 'off-the-shelf' tech careers, but also to pass on appropriate technology to the world's less-developed regions," Swan says.

That "can do" attitude shows through in the idea of WokFi.

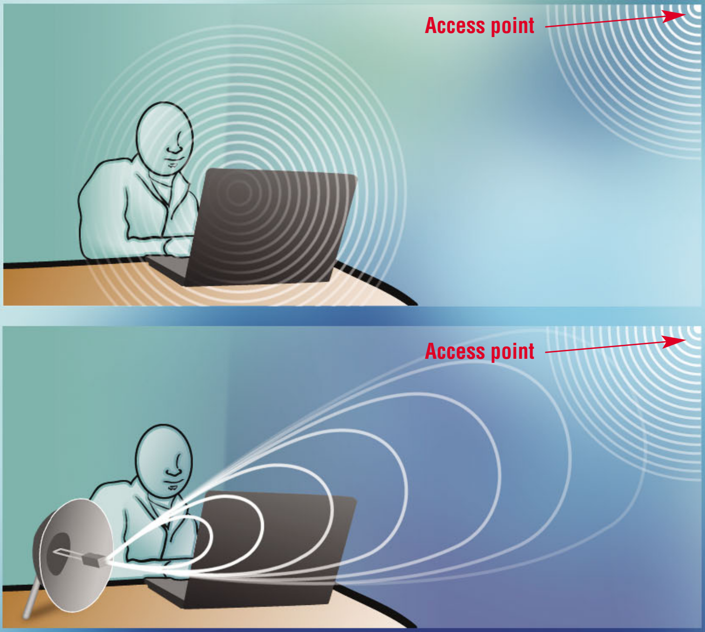
"I've had numerous interviews since this whole WokFi approach, initially part of a wireless networking class, took off three years back," Swan says. "In spite of the idea now being pretty well established, the resource site is more popular than ever, with about 50,000 hits this month (March)."

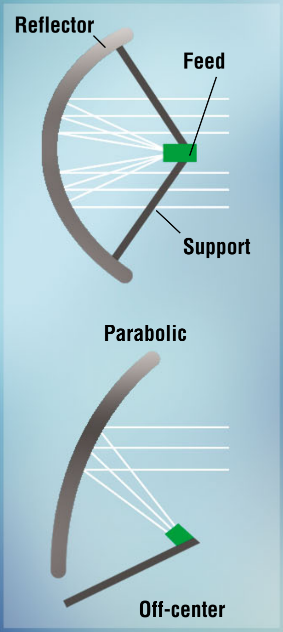
Matt Westervelt, founder of Seattle-Wireless and owner of Metrix Communication LLC, has outlined his experiences with WokFi and other wireless DIY devices on his blog at the SeattleWireless Web site. He suggests

Focusing The Signal

The principle behind the wok USB device (WokFi) is pretty simple: You use the angle and metal surface of the wok to focus a Wi-Fi signal, giving the WokFi a better chance of successfully picking up the signal. You'll receive boosted signal strength and more signal range with the WokFi. The shape of the wok is close to a parabolic reflector and helps focus the signal toward the feed, naturally increasing signal range (as shown at right). An off-center dish is useful in some circumstances, but it doesn't help with signal range.

For commercially available products that perform a similar function, Hawking Technologies makes a USB wireless dish adapter, which provides more signal range and costs about $70. It's a small dish (as illustrated at bottom left), and it is designed for interior use (although you can aim the dish through an open window to pull in distant Wi-Fi signals).





When using a USB Wi-Fi adapter alone without a dish, the tiny antenna inside the USB Wi-Fi adapter searches for signal in an area all around the adapter; it's not focused in one direction (as illustrated at upper left). By adding a parabolic reflector, you can focus the search for the signal directly toward the Wi-Fi access point.

Although the USB wireless dish adapter is handy, you could save a little money making your own wok USB antenna. Besides, what the fun in buying an already constructed dish? ▲

Sources: Hawking Technologies, SeattleWireless, Stan Swan, Wikipedia anyone planning to create a WokFi should approach the project with the idea of having fun.

"Since you're just tossing some parts together, you don't get any sort of guaranteed gain (in signal), a known beam pattern, or anything else you'd get out of a commercial antenna," Westervelt says. "What you do get is generally more signal than you started with. You can also get less if you don't put things in the right places, or if you don't point it in the right direction."

Westervelt and Swan say you can use Netstumbler (netstumbler.com) to measure the gain in power and determine the best positioning for the WokFi.

"WokFi construction is a breeze . . . and performance typically is 12 to 15 decibels gain above the raw USB WLAN dongle," Swan says. "A large part of the satisfaction gained relates to feedback from '$1-a-day global regions' that it works!"

Keep in mind that when constructing a WokFi device, you are not *creating* an antenna; you're simply using the wok to concentrate the Wi-Fi signal for the tiny antenna that already exists inside the USB Wi-Fi adapter. Once you've collected all of the parts, Westervelt says you can construct the WokFi within a couple of minutes. You might need a few more minutes for adjustments.

"All you're really doing is putting a device in front of a parabolic reflector, so you just need to experiment with the placement and how you're going to keep it there," he says.

You can construct the WokFi quickly, easily, and inexpensively. Best of all, if you can't make the device work well or if it doesn't help your situation, you can try to return the wok to its intended use—cooking food. Depending on the size of the hole you drilled in the wok, though, it might be tough to plug it completely. Don't try cooking again unless you're sure the hole is plugged, or you'll spill cooking oil everywhere, lose most of your dinner, and likely be hungry again one hour later. ▲

by Kyle Schurman

FOR MORE INFORMATION

Stan Swan's Web site
usbwifi.orcon.net.nz

SeattleWireless Web site
seattlewireless.net

Matt Westervelt's blog
seattlewireless.net/~mattw

Putting Together The WokFi

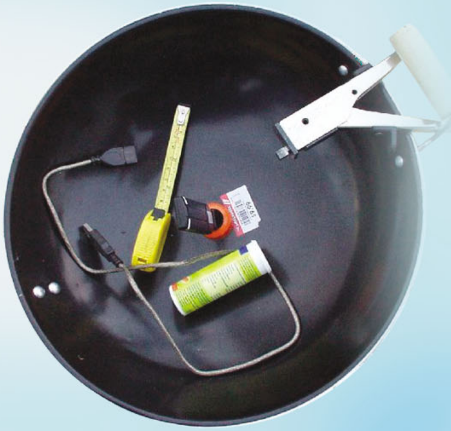
On average, you can expect to spend $50 to $70 to create the wok USB antenna, but you might be able to spend as little as $20 to $40 if you find a few bargains or if you have some of these parts already in your possession.

Wok (or some sort of bowl-shaped metal device; some people have used strainers, for example). Prices vary, but you probably can find one for less than $20, especially if you search stores that sell used kitchen appliances.

USB Wi-Fi adapter. Again, prices vary, but you probably can find one for $30 or less.

USB extension cable. Longer cables will cost a bit more, but you can find a 15-foot cable for less than $20. Be sure to use an extension cable; you'll need to fit the Wi-Fi adapter's USB connector onto one end of the extension cable.

Glue, tape, or epoxy. $3 to $5 (optional)



WokFi. Stan Swan, a New Zealand educator and Wi-Fi enthusiast, created the WokFi device shown here. Swan's WokFi uses a garden hose joiner to hold the USB Wi-Fi adapter in place (shown here); some others drill a hole in the wok and then attach the adapter with glue or tape. Use the tape measure to measure the wok and find the optimal positioning (focal point) for the USB Wi-Fi adapter. Place the USB Wi-Fi adapter in the joiner or through the drilled hole with the connector extending from the back of the wok. If you use glue to hold the USB Wi-Fi adapter in place, take care to keep the glue away from the connector. Then run the USB extension cable from the adapter to your computer. You'll need to adjust the angle and position of the wok to find the strongest and most reliable Wi-Fi signal. Some people attach a tripod or pole to the wok, using the handles. Swan uses a small plastic bottle to protect the adapter from the elements.

Sources: Stan Swan, SeattleWireless (WokFi photo courtesy Stan Swan.)

Active Denial System

The Military's New Vision Of Crowd Control

Shout or shoot: Those are the two decisions military and law-enforcement personnel often face when confronted with a rioting mob or an unruly crowd. The officials start by using a bullhorn to address the crowd, asking those involved to leave the area.

If that doesn't work, law enforcement and military personnel don't have a lot of other options. Most nonlethal weapons currently in use, such as rubber bullets, beanbag projectiles, tear gas, pepper spray, and Taser guns, can be very effective for law enforcement, but they also carry the danger of occasionally causing unintended serious injury or death.

In a war zone, the nonlethal weapon options for military personnel rarely are practical. When combatants integrate themselves among noncombatants, the problems for military personnel become more complex. Finding a nonlethal weapon that would lower the risk of injury to noncombatants has been a focus for military researchers for many years.

The ADS (Active Denial System) is a nonlethal weapon designed to direct an energy beam at a human target. The beam creates an intolerable heating sensation on the target's skin, causing the target to immediately attempt to flee the area to escape the beam. The beam only penetrates the skin about 1/64th of an inch, and more than a decade of research into ADS has failed to show any significant safety concerns. The DoD's JNLWD (Joint Non-Lethal Weapons Directorate) took over the project after the Air Force Research Laboratory developed the technology originally, and Raytheon has been involved in development of the ADS, too.

The ADS provides a longer range of effectiveness (up to 500 yards) than traditional small arms and nonlethal weapons, and it serves as an alternative to using lethal force, depending on the circumstances. ADS gives soldiers additional flexibility when conducting missions. The JNLWD calls it "an alternative between shooting and shouting." ADS can target an individual, force multiple targets to leave an area, or control the movements of a crowd, all without destroying infrastructure.

Adding Mobility

The initial version of the ADS was large, requiring a small building to house

Safety Concerns With ADS

The ADS' millimeter wave energy only penetrates the skin up to 1/64th of an inch (about the thickness of three sheets of paper, as shown in this illustration of a close-up of the skin). But it "excites" water in that thin layer of skin, heating it to about 130 degrees Fahrenheit and causing the unbearable sensation.

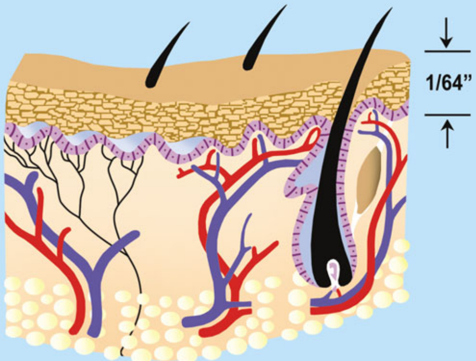
The JNLWP conducted 12 years of research, determining whether the millimeter waves used with the ADS could injure humans.

"It was a careful progression of researching the bio-effects, the hardware development, and the proof of how robust and safe this technology is," Dr. Diana Loree says.

The JNLWP conducted ADS exposures on humans more than 10,000 times with no adverse health effects, outside of a few pencil-eraser-sized blisters on the skin of some targets. The research showed the ADS:

- Does not injure eyes (because of the blink reflex, the eye closes, and the beam cannot penetrate the thickness of the eyelid)
- Does not affect contact lenses
- Does not affect coins or metal jewelry
- Does not cause skin cancer
- Does not damage reproductive organs
- Does not affect people differently who have consumed alcohol

ADS targets would only be exposed to the ADS beam for a few seconds because humans instinctively move away from the beam immediately after it strikes them. It's unclear whether long-term damage could occur in humans who were exposed to the beam for extremely long periods, but that may not really matter because the intent of the ADS would be to continually expose the targeted human for a few seconds, at most. As an additional safety feature, the system's software and configuration automatically limit the duration of the beam, should a target be unable to move and avoid the beam.



Three panels within the framework of the DoD studied the safety issues surrounding the ADS. A Penn State University panel also studied the ADS in 2002 and 2004, determining it created minimal risk of injury to humans. DoD policy states that all nonlethal weapons must undergo the same review processes that lethal weapons undergo. The JNLWP claims the ADS is the most reviewed and studied nonlethal weapon in the history of the DoD. ▲

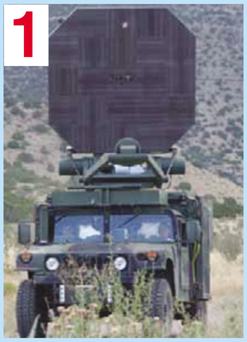
Source: JNLWP

How ADS Works

When the ADS is activated, the antenna mechanism unfolds and rises above the vehicle (**1**). Malibu Research Associates of Camarillo, Calif., developed the antenna. A parabolic antenna works well with ADS because it can radiate a narrow beam in a specific direction over a long distance.

The operator uses a computing system and a joystick-like device to rotate and aim the antenna, using a video camera mounted on the antenna to find the target. The thermal video image that the ADS operator uses for targeting (**2**) works day or night.

The ADS uses a gyrotron to generate a focused electromagnetic energy beam. Beams generated with a gyrotron are different from a laser and are not radioactive. Communications & Power Industries of Palo Alto, Calif., manufactures the gyrotron (**3**), which essentially is a high-powered electron tube.


1

2

3

4

First, the ADS makes use of a superconducting magnet to create a strong magnetic field. The magnetic field accelerates the electrons, which allows the gyrotron to generate the energy beam. The gyrotron spins the electrons in a circle, which allows it to continually apply an accelerating voltage, which is necessary to push the beam to near the speed of light.

The Humvee uses an 85-kilowatt continuous electricity generator (**4**) to power the gyrotron tube and the 3.7-tesla superconducting magnet. The generator also fuels a powerful refrigerator, which cools the magnet to 4 degrees Kelvin (-452.57 degrees Fahrenheit), allowing it to work properly.

The JNLWD retrofitted the Humvee, disconnecting its diesel engine from the drive train. Instead, the diesel engine powers the electricity generator, which then provides the power to drive the Humvee. A set of Li-ion batteries stores the diesel engine's excess energy, providing it for the ADS.

The focused beam is effective throughout its range up to 500 yards. Metal reflects and blocks the beam, and the beam cannot penetrate walls because it requires line of sight. A windshield would cause a slight degradation of the beam, but it still would work. Clothing, even thick coats, do not affect the beam.

"There's no moisture in the clothing to absorb the energy," Loree says, and "The skin's moisture absorbs the energy." ▲

Source: JNLWP

the components. The current version is contained in a Humvee called the HMMWV (Highly Mobile Multi-Wheeled Vehicle). The antenna (the square-shaped dish atop the vehicle) delivers an electromagnetic 95GHz millimeter-wave beam at the speed of light. The system does require line-of-sight with the target, and it works day or night. It has a low cost per shot, and it doesn't require stockpiling, as do traditional weapons.

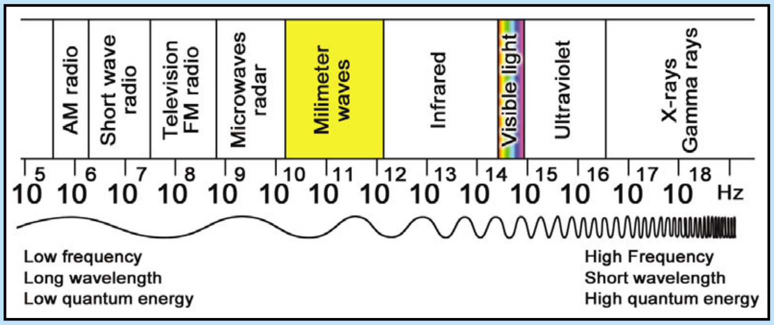
The ADS integrated into the HMMWV runs completely from the power generators and the engine in the Humvee; it doesn't need an external power source, making it a mobile weapon. The large antenna mounted on the top of the

Microwaves vs. Millimeter Waves

Even though they're neighbors on the electromagnetic spectrum, microwaves and millimeter waves affect objects much differently, which is the key to the ADS not causing serious injury to humans.

Microwaves use longer wavelengths—4.7 inches—compared to the wavelength of millimeter waves (0.12 inches in a vacuum). The longer microwave wavelengths allow them to penetrate deeper, which makes them useful for cooking food. Microwaves typically operate at a 2.5GHz frequency, much lower than the 95GHz frequency used with ADS. Because of the shorter wavelengths, millimeter waves only penetrate about 1/64th of an inch (or about 0.015 inches) into skin. The moisture in skin absorbs the energy in millimeter waves, preventing it from penetrating any farther.

The millimeter waves can penetrate fibrous materials, such as clothing, and the clothing will not alter the waves. Glass, such as a windshield, does alter the waves slightly, but they remain effective on a target. The millimeter waves cannot penetrate through metal, such as in a car door. ▲



Source: JNLWP

HMMWV folds down horizontally when it's not in use, allowing the vehicle to drive normally.

At some point in 2007, ADS System 2 will be available. System 2 will work either from a fixed location or mounted on a smaller truck than the HMMWV. ADS System 2 will be a fully contained system.

The Effect

The ADS energy beam creates a sensation of heat that's almost instantly unbearable when the beam strikes a target, and he or she quickly attempts to move out of the beam. The ADS works equally effectively regardless of the age, gender, or body type of the targeted human. Research showed very few volunteers could remain in the beam for even as long as three seconds; most involuntarily moved away from the beam almost instantly.

Despite the intense sensation, the beam only affects a tiny layer of skin, because the short wavelengths that the millimeter beam uses can only penetrate the skin an extremely small distance.

"The penetration depth is related to the wavelength; it's a basic law of physics," Dr. Diana Loree, ADS technical manager, says. "Nothing's going to change that. The energy [from ADS] stays superficial [on the skin]. There's nothing magic or mysterious."

The DoD has tested the effects of ADS over a 12-year span using thousands of tests on human volunteers. Independent organizations have verified the DoD's test results, which show that the ADS—as configured by the JNLWP—doesn't cause permanent damage or serious injury to human tissue.

The Future Of ADS

The JNLWP continues to research ADS, seeking methods for shrinking the components needed to generate the beam, both in size and in weight.

In the future, the JNLWP expects to see the ADS incorporated on devices other than vehicles. For example, a gun manufacturer could mount a small ADS on the front of the weapon, allowing for both lethal and nonlethal capabilities from the gun. Airborne ADS also would be possible, with the unit mounted on an airplane or helicopter.

Ultimately, though, the future of ADS is dependant on branches of the military believing in the technology's safety over current nonlethal weapons, such as rubber bullets and beanbag projectiles that use kinetic energy principles. When kinetic energy drives a nonlethal weapon (such as a beanbag fired from a beanbag cannon), unintended injuries are more common, especially to smaller people. Such weapons deliver the same amount of force against all targets, regardless of the age or weight of the target. Because of this, people with smaller bodies could suffer greater injuries from a kinetic energy weapon than a large-bodied person because smaller people cannot absorb the energy from the hit as easily. The ADS beam's effect is dependant on the target's weight and skin surface, and ADS would be safer to use on different-sized people. The range of an ADS beam is 10 times greater than most kinetic energy nonlethal weapons, too.

"Now that the capability [of ADS] is proven, it is up to the [individual military branch] services whether they want to decide to purchase it," Loree says. "Then we'll tailor the hardware to their specific requirements and needs. As we re-tailor things, everything will continue to be checked [for safety]."

Loree says the most difficult aspect of working with ADS has been public misperception. Rumors about the types of injuries ADS could cause and about how ADS could affect a human's eyes or about how the beam could affect coins in a pocket have spread through various Web sites. The JNLWP decided to hold a Media Day in early 2007 designed to allow members of the media to experience the ADS—and its effects—for themselves.

"There's a lot of misinformation out there," Loree says. "We want to demystify the system. We know that we have the data that is required to answer all of the legitimate questions. We're being as open about the technology as we possibly can. It's a good thing. It's a nonlethal technology . . . that will protect the innocents caught up on a battlefield. We've got to make sure that folks have accurate information." ▲

by Kyle Schurman

Silent Guardian

Raytheon's work with the ADS has resulted in its Silent Guardian product, which is available for law enforcement departments in the United States. Raytheon calls Silent Guardian a "mid-range" ADS, and its maximum range is a little over half that of the JNLWP's ADS. However, Silent Guardian's overall technology is very similar to ADS.

Raytheon says Silent Guardian's antenna will work in rain, dust storms, and fog. The antenna also can continue operating even when damaged by bullets. Silent Guardian can be placed on a large vehicle for transportation and can be operated from the vehicle as a mobile device or as a stationary device. ▲

Silent Guardian Specs

Transmitter unit dimensions (HxWxD). 95 x 83 x 94 in.
Transmitter unit weight. 6,440 lbs.
Transmitter height with antenna. 136 in. to 147 in.
Antenna size. 45 square inches
AC/DC converter unit dimensions (HxWxD). 65 x 45 x 74 in.
AC/DC converter unit weight. 3,870 pounds
Antenna stabilization. Able to operate in 40mph winds
Retargeting speed. Less than two seconds required
Standby to armed. Less than two seconds
Range. More than 250 meters
Environmental limitations. None
Maximum temperature for operation. 125 degrees Fahrenheit

Source: Raytheon

Other Nonlethal Weapons

Nonlethal weapons have existed for several decades, but they all carry a slight risk of serious injury and death. Developers of ADS say their system is far more safe than other types of nonlethal weapons currently in use. Other types of energy beam-type nonlethal weapons are under development, as well.

Chemical. Generally, any chemical used to cause temporary incapacitation of a person by irritating the eyes or respiratory system is called tear gas. Tear gas first appeared in World War I in 1914. Today, some law enforcement divisions uses tear gas in canisters and grenades to incapacitate hostile targets inside a building or to control rioters. Pepper spray is a common type of tear gas. Professors at the University of Georgia invented pepper spray in 1960. Pepper spray, also called oleoresin capsicum spray, can cause tearing of the eyes, temporary blindness, and inflammation of the skin and respiratory system. Eyes sometimes temporarily swell shut, too.

Other types of chemical nonlethal weapons under research include stink bombs (malodorant agents), where an overpowering odor could cause a crowd to disperse without injury, and hallucination bombs (calmative agents), which would induce sleep or hallucinations among the targets, leaving them unable to repel an attack.

Kinetic energy. Law enforcement officials have used several kinds of nonlethal projectiles fired from guns in the past 50 years to control rioting crowds, including plastic bullets, rubber bullets, wood batons, and beanbags. Such projectiles can cause serious injury and death when not deployed correctly, and they cause greater injuries to smaller people than to larger people. Water cannons also fit under the kinetic energy category.

Optical. Flash-bang grenades and light-flash grenades temporarily blind and disorient a target, leaving them unable to repel an attack or distracting them from watching the area where the attack will take place. Research continues into strobe lights that could temporarily disorient a target, as well.

Taser. The initial Taser system appeared in the early 1970s, but the government deemed it as a firearm, leaving it subject to strict laws. In the mid-1990s a nonlethal, nonfirearm version of the Taser appeared. Law enforcement began using the Taser in the late 1990s as an alternative to using physical force. It applies an electrical shock to the target, incapacitating him. Some debate continues over whether the Taser is safe enough for use by law enforcement against targets.

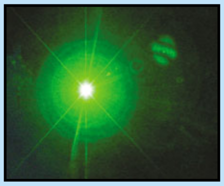
Chemical

Kinetic energy

Optical

Taser

Lazer Dazzler



“Vomit” beam

Several energy-beam nonlethal weapons are under research and development. Only one is as far along as the ADS. Most are still simple ideas that have a long way to go to be useful. But there are some interesting—and disgusting—ideas. Researchers have to use care with these types of nonlethal weapons, making sure they don't violate any treaties and laws regarding the use of weapons.

Electromagnetic Pulse (EMP). Even Jack Bauer couldn't stop an EMP blast in the TV show “24,” so this nonlethal weapon would have to be very powerful . . . if it existed. No country's military has admitted having successes with non-nuclear EMP weapon research yet; various news reports indicated the United States may have used an EMP bomb against Iraq in 1991 or 2003, but the U.S. military has never confirmed this. An EMP would disrupt and damage electronic equipment within the range of the blast. (A nuclear bomb carries an EMP when detonated.) A non-nuclear EMP weapon, also called an e-bomb, probably would only affect a small area.

Laser Dazzler. This device, which is already in use, creates a cloud of green laser light that temporarily blinds a target from a distance of 200 yards or more at night, causing them to stop or slow down. Because of its large spot size (similar to a flashlight), the Laser Dazzler, from LE Systems, is intended to be safe for the target's eyes from a distance. It isn't intended for close-up encounters. According to news reports, military personnel sometimes have used the Laser Dazzler in Iraq to slow uncooperative drivers at vehicle checkpoints, but questions about long-term effects on the health of a target's vision have prevented more widespread use of the device.

Microwave beam. University of Nevada researchers are looking into a beam that uses microwaves operating at a frequency between 0.75GHz and 6GHz that could block signals to the muscles, causing temporary paralysis to the target. This project is still very early in the research process.

“Vomit” beam. Invocon Inc. is developing a radio frequency energy beam—called EPIC (Electromagnetic Personnel Interdiction Control)—that could penetrate walls and make the humans inside lose their balance with motion sickness, likely causing them to vomit and be unable to resist an assault. (With all of the ways to describe that particular bodily function in the English language, you'd think Invocon could come up with a more accurate acronym.) Invocon was scheduled to present at a U.S. Navy conference in the spring. ▲

FRIGID PHYSICS

THE SCIENCE OF PC COOLING

Today's chips can contain hundreds of millions of transistors and generate an amazing amount of heat. If sufficient cooling was important a few years ago, it's absolutely vital now.

Cooling technologies have also followed suit and advanced significantly in the past several years; you have more options than ever for keeping your chips cool and operating at top efficiency. Each type of cooling technology has advantages, depending on your situation. Learning about some of the components and processes behind each cooling technology can help you decide which cooling system will work best for you.

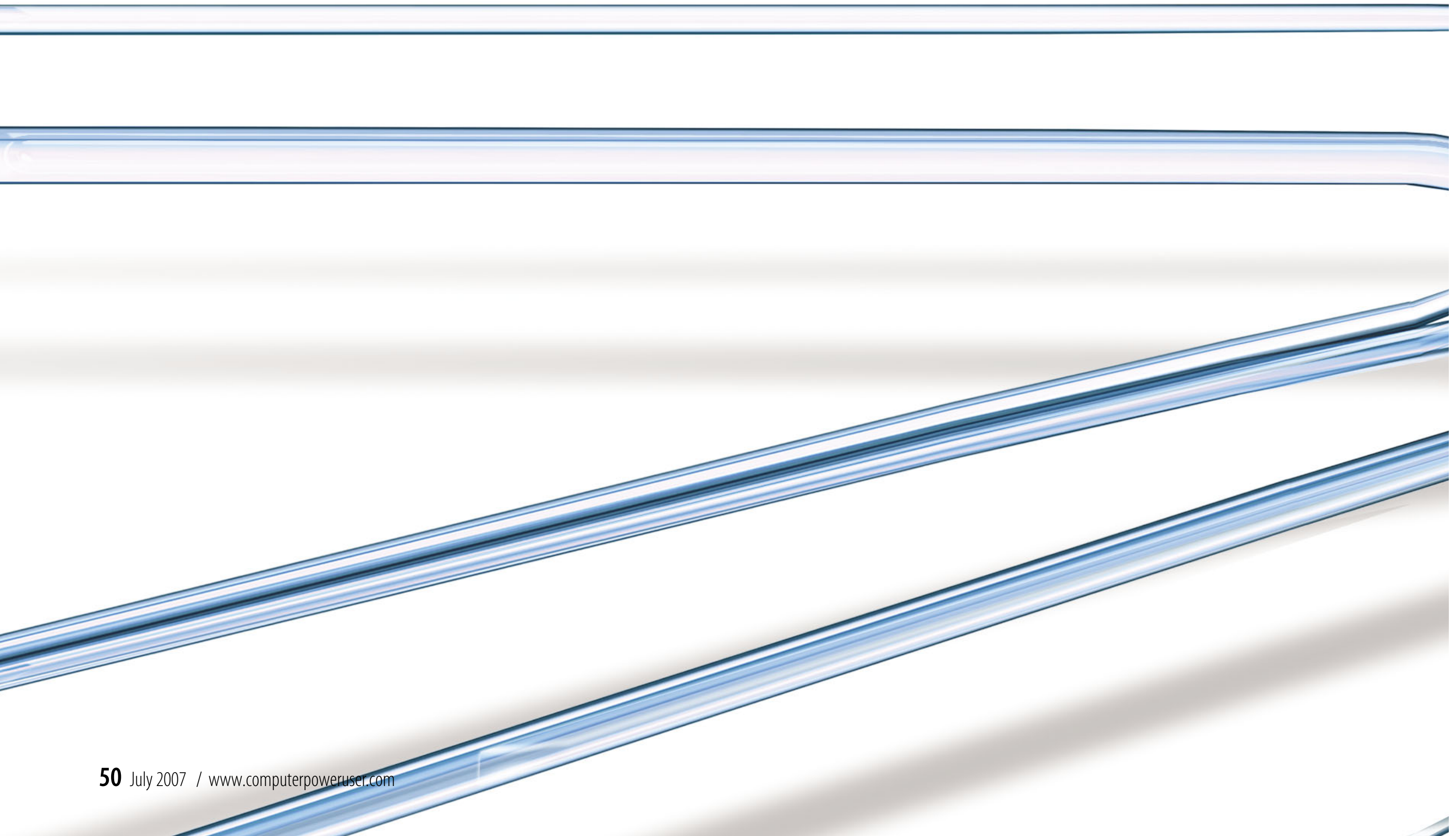
Forced-Air Cooling

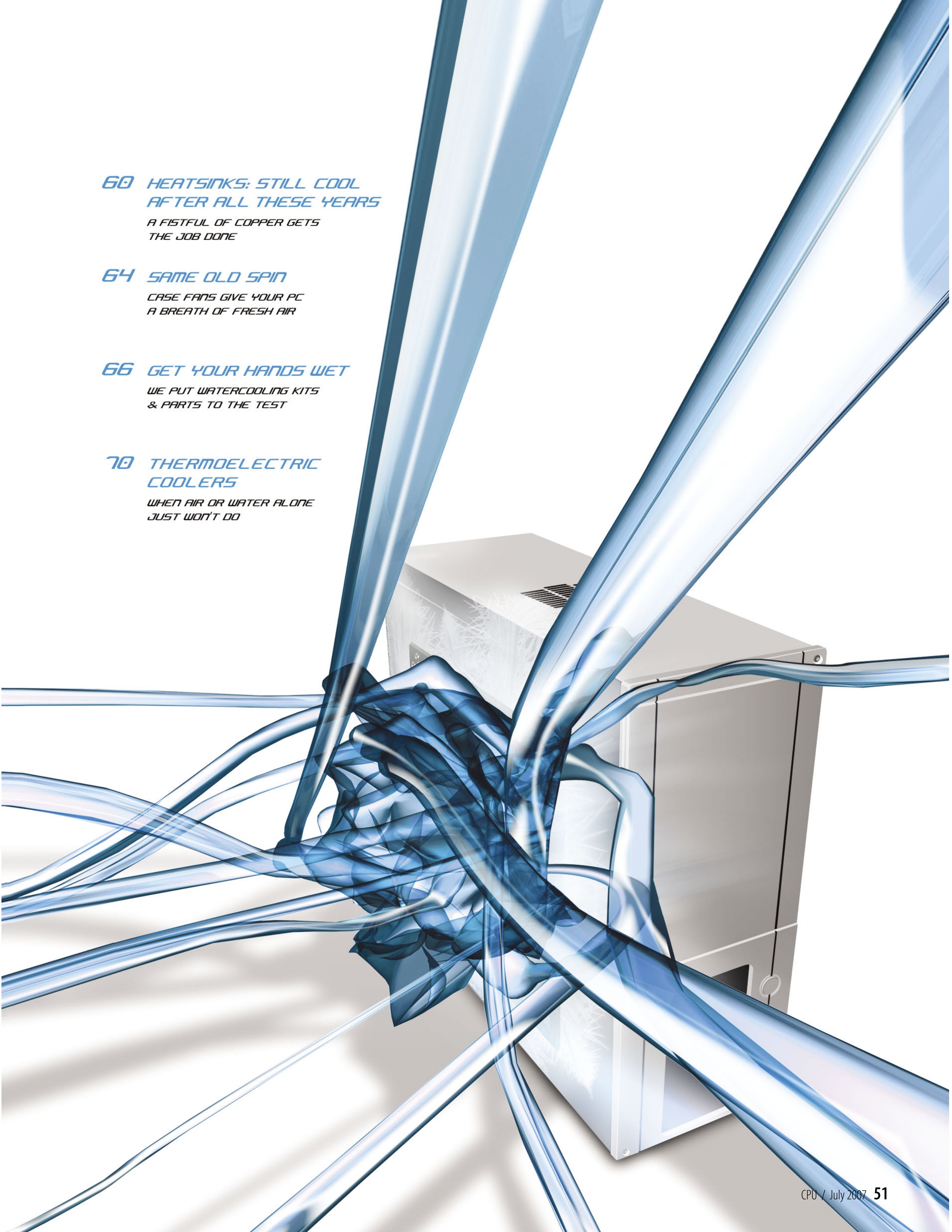
A forced-air cooling system, which makes use of a heatsink and an attached fan, is the most basic and least expensive cooling system you can employ in your computer. Forced-air cooling systems began appearing in the early 1990s and still appear in most standard computing systems. Modders and overclockers need more formidable cooling. They'll usually choose more extensive forms of cooling, but they'll also pay more, too.

"For extremely hot computers, liquid cooling is the way to go," says Jon Bach, president of Puget Custom Computers (www.pugetsystems.com), which specializes in custom-built computers. "For everything else, an intelligent mix of forced-air and passive cooling fits the bill. When you're really picky about noise is that you have to be more careful. When choosing your case, make sure it has a good air path so you can get the air movement you need with fans at very low speeds."

Although forced-air cooling systems work reliably in many systems, a few things can cause problems with heat.

Dust. As air moves through the computing system, dust and other airborne particles are sure to follow. If you don't occasionally remove the dust from the fan, the heatsink, and any grilles, it could block air trying to exit the case or damage fans, leaving them inoperable. And heatsinks coated in dust or pet hair don't conduct heat as well.





60 HEATSINKS: STILL COOL AFTER ALL THESE YEARS
A FISTFUL OF COPPER GETS THE JOB DONE

64 SAME OLD SPIN
CASE FANS GIVE YOUR PC A BREATH OF FRESH AIR

66 GET YOUR HANDS WET
WE PUT WATERCOOLING KITS & PARTS TO THE TEST

70 THERMOELECTRIC COOLERS
WHEN AIR OR WATER ALONE JUST WON'T DO

Poor ventilation. Several problems can restrict air flowing through your computer case, including bundles of cables that block fans or grilles. You need to make sure the grilles and fans in the case have several inches of clearance around them, letting air flow into and out of the case.

Poor thermal transfer. Microscopic imperfections in the heat spreader of a chip and the heatsink cause air gaps in the connection, which lowers the heatsink's ability to efficiently draw the heat away from the chip. Thermal grease and other thermal compounds are an essential part of every system's cooling setup and can minimize these gaps, but you must apply them properly. (See the "Thermal Compounds" sidebar for more information.)

Lapping the heatsink will reduce the imperfections in the heatsink's surface and improve the heat transfer efficiency. Lapping involves sanding the surface of the heatsink with sandpaper of several grit levels, using finer grits each time.

Passive Cooling

Passive cooling systems make use of heatsinks but don't rely on an attached fan to circulate air through the heatsink's fins. Instead, the natural airflow through the computer's case cools the heatsinks. Or, in some passive cooling systems, the heatsink is located outside the case.

Although using a heatsink alone isn't practical on today's CPUs, it will work on a few other types of chips, such as an

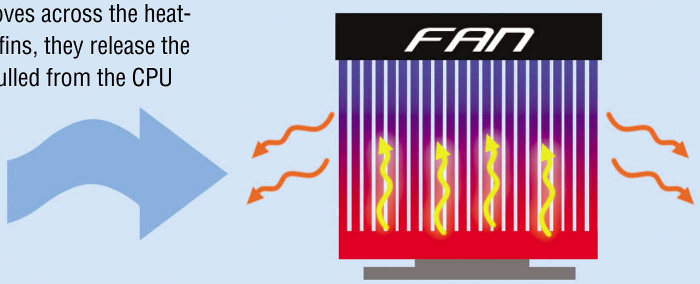
Forced-Air Cooling

With today's CPUs, a heatsink alone cannot adequately cool the CPU core. All CPU heatsinks contain a fan mounted directly to the top of the heatsink, giving it additional airflow.

Because of conduction, heat from the CPU migrates into the heatsink (yellow arrows), heating the metal. The fan pulls air from above the heatsink and blows it through the heatsink's fins (blue arrows). As the air from the fan moves across the heatsink's fins, they release the heat pulled from the CPU (red arrows). The natural airflow through the computer case (blue arrow) then pulls the heat away from the area around the heatsink and, eventually, out of the case. Some users prefer to reverse the heatsink's fan to exhaust hot air away from the heatsink's fins.

By placing tall fins on top of the heatsink base, the heatsink has far more surface area than if it were one solid block. With more surface area, the fan's airflow over the metal can more easily cool the heatsink. At the same time, the heatsink's fins require a good design that makes it easy for the air to circulate among and between the fins.

Heatsinks typically consist of copper or aluminum. Some heatsinks use a copper base and aluminum fins to save money in the manufacturing process. ▲



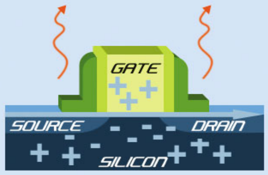
Generating Heat

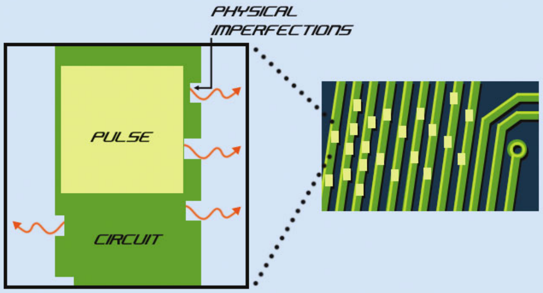
Finding ways to cool chips wasn't a significant concern in the early days of computing. Even as recently as 15 years ago, 486DX2 CPUs only used about 7 watts of power and contained 1.2 million transistors, and they didn't even need a fan on the heatsink. Today, however, some types of chips often require over 100 watts of power, and chips sometimes contain half a billion transistors and more. Such chips wouldn't function long without significant cooling capabilities. Computers will shut themselves down, run slowly, or generate errors as chips overheat. In extreme conditions, an overheated chip's components could break down and destroy themselves before the system can slow itself or shut down.

Heat generation in chips typically comes from two areas.

First, each time the transistor handles an electrical pulse to record a data bit, the transistor releases a small amount of heat. In recording the bit, negatively charged particles in the silicon move toward the gate, causing a slight leakage in electrical power, which generates heat.

Second, as the electrical pulses move through the circuits, they'll encounter microscopic imperfections, which cause resistance. Each instance of resistance transforms some of the pulse's energy into heat.As chips run at higher speeds, more pulses move through the circuits and more transistors record more data more quickly, which magnifies the generation of heat. ▲





MCP. Some heatsinks will incorporate heatpipe technology, which is another form of passive cooling that makes use of a sealed pipe containing liquid to transfer heat away from one area to another. (See the "Heatpipe Technology" sidebar for more information.)

The biggest advantage of passively cooled systems is they cause no additional noise for your computer. They use no directly connected fans, instead making use of the fans already in the system. A heatpipe system typically requires less space inside the computer case than a liquid cooling system, as well. And the heatpipe system is very effective in providing cooling. However, installing a heatpipe yourself can be expensive.

Liquid Cooling

Although liquid cooling in computers is newer than the cooling standard of fans and heatsinks, the idea of liquid cooling has been around for decades in other capacities, such as a car's radiator. Prices for liquid-cooling products in computers have fallen in recent years, making it a more realistic option for computer users.

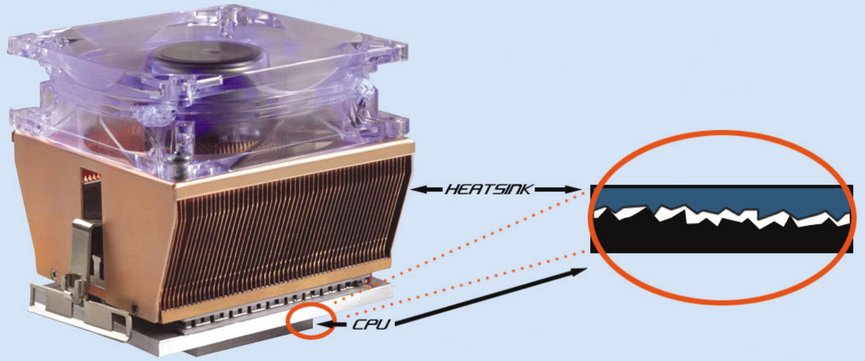
"Watercooling adds complication to a system," says Bach. "More items can break or leak, and the maintenance is greater."

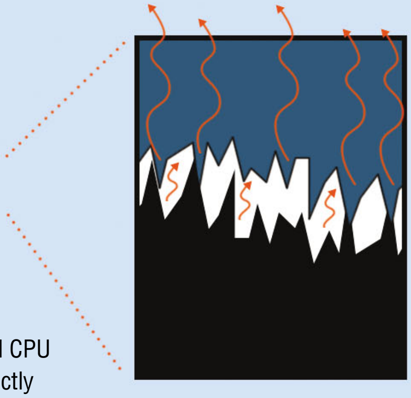
"It does physically pull the heat out of the system more efficiently, though, so, technically, it is providing those maximum results."

Liquid cooling provides some significant advantages over passive and forced-air cooling. Water does a better job drawing heat away from an object than air because the water can carry the heat to a specific location. And water can absorb more heat without raising its temperature than air, copper, or aluminum. It has a higher specific heat capacity. A single liquid-cooling system sometimes can cool multiple components.

A liquid-cooling system operates a lot like the cooling system in your car's engine, in which the engine moves coolant fluid through a series of tubes and channels in and near areas where the engine heats. The heat transfers from the warmer area (the engine) to the cooler area (the fluid). The fluid then travels to the radiator, where fans let the fluid release the heat into the air. (See the "Liquid-Cooling System" sidebar for more information.)

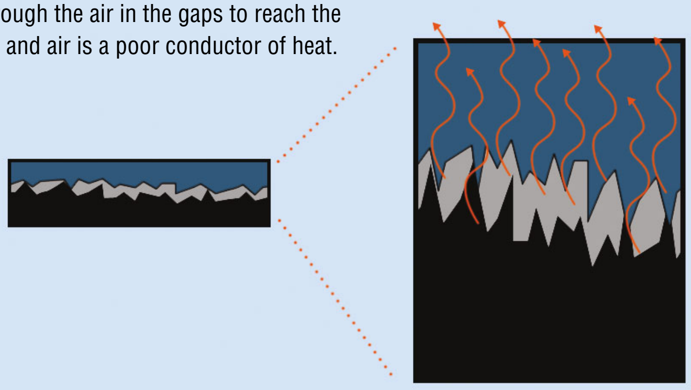
Thermal Compounds





To achieve the greatest conduction of heat from the CPU, it's important to directly connect the heatsink to the CPU. In this case, a clip tightly holds the heatsink above the CPU.

However, even though the heatsink and CPU appear closely aligned, they don't perfectly align because of natural, microscopic imperfections (peaks and valleys) in the surfaces of both materials. Where the surfaces don't make contact, the heat must move through the air in the gaps to reach the heatsink, and air is a poor conductor of heat.



Applying a substance that is a good conductor of heat, such as thermal compound (in gray), fills in the gaps and greatly improves the heat conduction between the CPU and the heatsink. Many thermal compounds contain metal particles (such as silver or aluminum oxide) to further improve conduction.

The liquid-cooling system in your PC requires several parts to work properly. The radiator, fans, and pump are important, but so are the following parts:

Waterblock. The waterblock is a large piece of thermally conductive metal that sits above the chip that needs cooling. Designers place several rows of small channels inside the waterblock; these channels carry the cooling liquid. (See the "Waterblock" sidebar for more information.) In some liquid-cooling systems, a large waterblock covers more than one chip. Because it's important to have a proper fit between the waterblock and the chip, you'll need to make sure the waterblock you choose is compatible with the chips you want to cool.

Tubing. Selecting the best tubing for your system requires some forethought. Most designers select tubing between 0.375 and 0.625 inches in diameter, which provides the best liquid flow through the system. Also, the type of tubing is important. More expensive tubing typically is less susceptible to kinking, which is especially important if you must wind the tubing around several components. (You can attach 90-degree elbows to the tubing to make winding around corners without kinking easier.) If your tubing kinks or starts to flatten out, you can add PVC coils around the tubing to maintain its natural shape.

Liquid. Water works very well as the coolant for a liquid-cooling system. However, the type of water you choose is important. Tap water doesn't work well, as it contains micro-organisms and dissolved minerals, which will likely cause your system to eventually break down. Distilled water works well because it doesn't contain bacteria or algae and is the least expensive option. Nonconductive coolants are more expensive than distilled water but provide additional protection to your computer's electrical components in case of a leak.

Finally, your system could have rust problems if you use two different types of metal in the system, such as a copper waterblock and aluminum radiator. Using two different metals can create an electrolytic cell in the system, which causes oxidation and rust. To avoid oxidation, use an antioxidant additive in the liquid. In some instances, distilled water itself also will cause oxidation; you may want to use an antioxidant additive whenever using distilled water in your liquid cooling system.

Liquid-Cooling System Maintenance

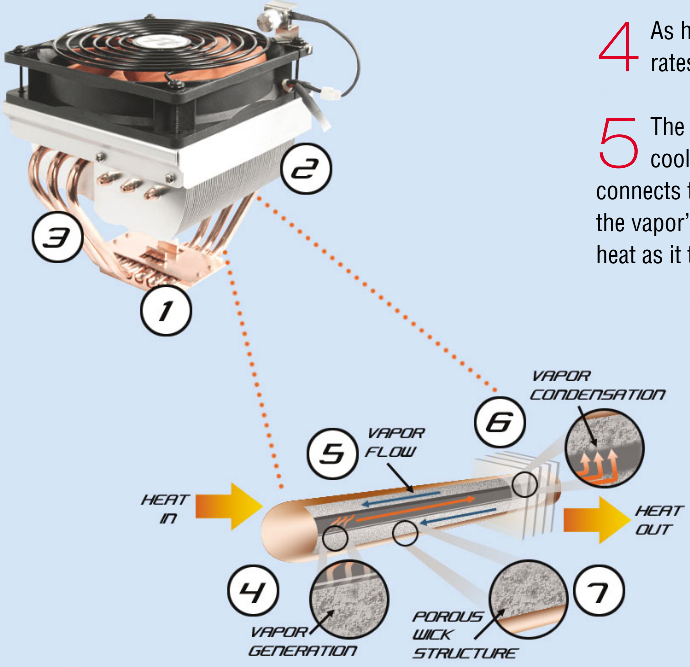
Liquid-cooling systems require more maintenance and carry a greater risk to the components in your computer than do air-cooled systems.

It's probably best to drain a liquid-cooling system about every six to 12 months, completely cleaning the entire system, although Bach says he doesn't clean his system that often.

Heatpipe Technology

1 A heatsink over the chip provides the initial cooling.

2 The first heatsink then connects (via heatpipes) to a second heatsink with ultra thin fins.



3 The heatpipes are heat transfer devices, moving heat from the CPU and the first heatsink to the second heatsink. Inside each vacuum-sealed heatpipe (as shown in lower part of graphic) is a fluid that evaporates and condenses. This phase change in the fluid causes the heat energy dissipation in the second heatsink.

4 As heat enters the heatpipe, the fluid inside the heatpipe evaporates, creating a pressure gradient.

5 The pressure gradient forces the heated vapor to flow toward the cooler area of the heatpipe (yellow arrow), which is where the pipe connects to the second heatsink. Because of the heatpipe's properties, the vapor's temperature remains constant; it releases almost none of its heat as it travels through the heatpipe.

6 Once the vapor reaches the cooler section of the tube at the end, it condenses, releasing its heat energy into the second heatsink, where it's dissipated into or outside the computer case, depending on the setup.

7 The condensed vapor then enters a wick structure, which uses capillary pressure and gravity to return the vapor to a fluid. The pressure and gravity also carries the fluid back to the other end of the heatpipe (small blue arrows), where the process begins again. ▲

"I have actually never had to clean out a liquid-cooled system," Bach says. "If I were to clean one, I think it would be easier to just retube a system than to clean it."

If you chose to clean the system, a mix of mouthwash and distilled water will kill germs and micro-organisms, and you can use it to flush out your system. Bach says using distilled water alone would suffice, too, but he says to be careful with other, harsher chemicals because they could leave residue inside the waterblock. Also, avoid any cleaner that could dissolve the tubing.

It's also vital that you constantly check for leaks in the system. Before installing the system in your PC, be sure to test it and make sure there are no leaks. If you're still worried about leaks, spend a little extra money on a nonconductive coolant. Such coolants will cost more up front but will give you some peace of mind.

Peltier Cooling

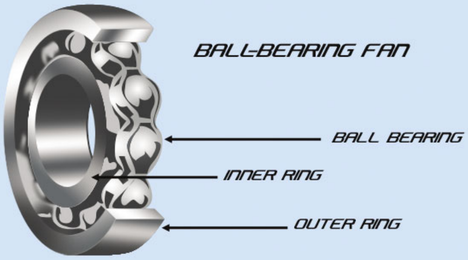
The scientist Jean Peltier discovered the Peltier effect (also called Peltier cooling or the thermoelectric effect) in 1834. He found that by applying an electrical current to the junction of two different metals, he could create a significant temperature differential between the two sides because one side absorbs the heat from the other side.

In a Peltier cooling system, designers connect the "cold" side of the system to the chip that needs cooling, and the system pulls heat away from the chip. The "hot" side continues to absorb heat from the cold side, but it now also absorbs the additional heat from the chip. Finally, the designers attach a heatsink to the hot side, which

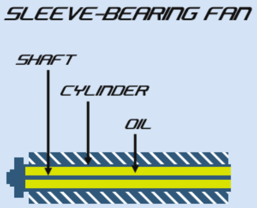
Types of Fans

When researching case fans, a few pieces of information are key.

Ball-bearing fans. A ball-bearing fan typically is going to generate more noise than a sleeve fan. However, on average, a ball-bearing fan can handle a high-heat environment better and will last longer. A ball-bearing fan consists of an interior metal ring surrounded by a ball bearing cage, then surrounded by an outer metal ring. The bearing cage holds equally spaced metal balls. The balls allow the inner and outer rings to spin, moving the fan. The fan's manufacturer places a thin lubricant on the balls before sealing the fan. You cannot add lubricant later if the fan breaks down.

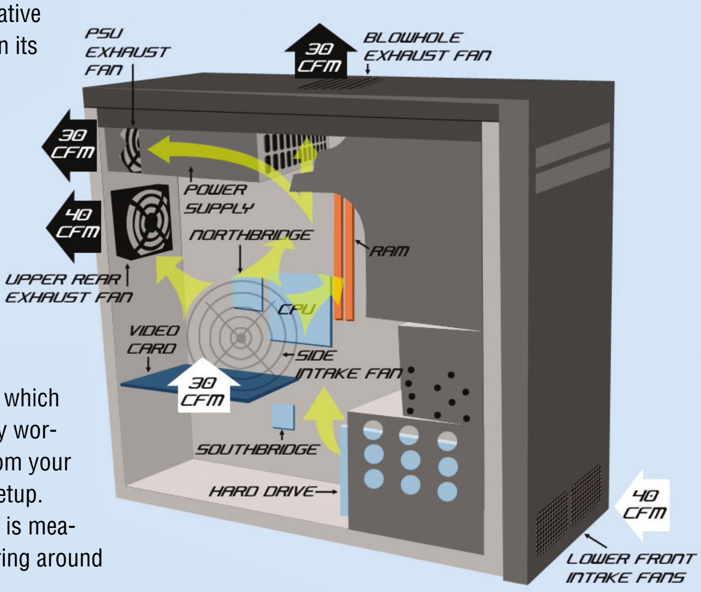


Sleeve-bearing fans. A sleeve-bearing fan will create less noise than a ball-bearing fan: A ball-bearing fan tends to emit a whining noise as the fan operates. Sleeve-bearing fans rely on a film of lubricant around the shaft of the fan to spin properly. Cheaply made sleeve fans use up the lubricant eventually, leaving the fan inoperable. You sometimes can add lubricant to this type of fan, but it's only a temporary solution.



When comparing manufacturer specs of different fans, you'll want to pay attention to CFM (cubic feet per minute) and dB (decibels of noise).

CFM. CFM is a measurement of the fan's ability to move an amount of air. By knowing the CFMs of all of your fans, you can determine whether your system has negative or positive pressure. A negative pressure system will have exhaust fans with a higher CFM than its intake fans' total CFM. As shown in the illustration, this case has negative pressure (100 CFM exhaust fans in black arrows and 70 CFM intake fans in white arrows). A case with positive pressure is the opposite; it has intake fans with higher total CFMs than the exhaust fans. If you're overclocking and need high-end cooling from your fans, you'll probably want negative pressure in your case because it encourages stronger airflow. Negative pressure cases reduce the frequency of "dead spots" inside the case. The biggest drawback to a negative pressure setup is the case must draw in additional air through grilles and vents, which could lead to more dust entering your case. If you're extremely worried about dust and don't need extreme airflow and cooling from your fans, go with an equal pressure setup or a positive pressure setup.



Decibels. Each fan should show a decibel rating; the rating is measured when the fan is running at its highest rpm. Fans measuring around 20dB or 25dB should be almost noiseless. ▲

helps it dissipate the heat into the surrounding air. A fan blowing air over the heatsink's fins will yield additional cooling.

In computers, you'll find Peltier cooling in action in TECs (thermoelectric coolers). Because a TEC works somewhat like a heat pump, it can effectively cool computer components below their ambient temperatures (something that the other types of cooling we've already discussed cannot do).

However, TECs have some disadvantages, too. First, because most TECs require a fan to cool the heatsink fins, they won't be completely silent (even though they'll likely be quieter than a forced-air system running multiple fans). Second, in some cases, the watts of electricity needed to run the system are larger than the watts of heat being dissipated. Third, TECs can increase your case's ambient temperature as they consume electrical power. Fourth,

Importance Of Airflow

Regardless of the type of cooling system you're using, airflow is important. By configuring the inside of your computer case to allow for free flow of air, you'll keep the case's internal temperature as low as possible. Having cool air inside the case will make any cooling system operate more efficiently. To improve airflow, try the following tips.

Add an air tunnel/cooling duct. You can use tubing and tunnels to direct air from outside the case directly to the chip that needs cooling. If you're having a problem getting a natural airflow through your case, using an air tunnel can help you avoid trouble spots and make the airflow more efficient. Obviously, you have to be careful that such a tube doesn't negatively affect the overall airflow in the case, but it's a good way to ensure a certain chip receives the maximum cooling capabilities.

Banish ribbon cables. Flat, ribbon cables can impede airflow–think of them like a sail on a boat. They catch the airflow and trap it. Where possible, you should swap out the ribbon cables for rounded cables, which don't block the airflow as significantly. Bundling sets of cables and attaching them to the side of the case can remove them from the case's natural flow of air.

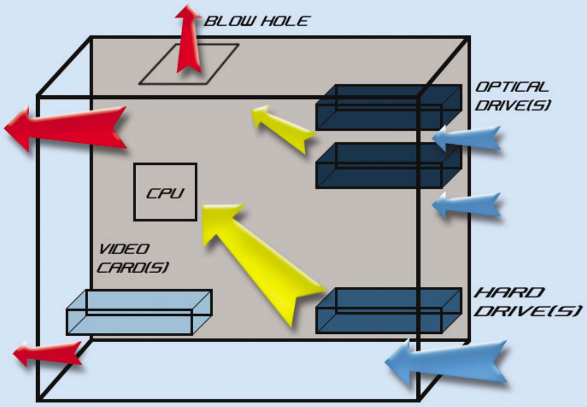
Properly place fans. Although it might seem like using as many fans as possible would achieve the greatest airflow, where you place each fan is more important than the number of fans.

"The biggest mistake with cases is using too many fans or building a case with no thought toward internal airflow," Frostytech.com's Max Page says.

Installing fans in locations that promote a good flow of air through the case will help you reduce the number of fans you need, which, in turn, reduces system noise. By studying the best fan placement, you also can ensure that cooler air from outside the case reaches the components that need it. You don't want to use an airflow design that directs air already warmed by the CPU toward the GPU, for example. Some cases make use of a "blowhole" in the top, which takes advantage of the tendency of hot air to rise. Finally, you don't want fans to be "competing" with each other; if two fans are aimed at each other, they're just creating a neutral spot that probably will collect heat.

Vent intelligently. Make sure you aren't blowing the warm air out of the case in a location where an intake fan can draw the warm air back into the case. It's best to keep all of the exhaust openings in one location (usually the back of the case) and the intake openings on a different side of the case.

"My best advice is to experiment," Puget Custom Computers' Jon Bach says. "See what happens when you flip a fan or cover a hole. A lot of it is common sense, but sometimes good old-fashioned trial and error is what you need." ▲



In this example of a typical ATX case, the airflow works well. The intake fans and grilles are in a good location, letting air easily flow throughout the case. And because the external fans and grilles are far away from the intake fans, you won't be blowing already heated air back into the case.

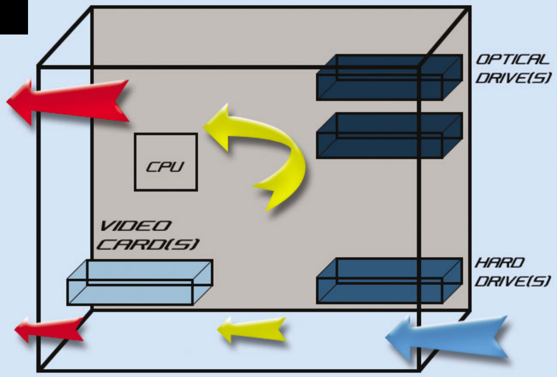
KEY

Large blue arrows: intake fans

Small blue arrows: Intake grilles

Yellow arrows: Flow of air through the case

Red arrows: Exhaust fans



In this ATX case example, the airflow at the upper left is problematic because it doesn't reach the majority of the case, and the intake fan could be pulling in already heated air. Also, the circular flow of air could block air entering an intake grille in the upper right of the case.

moisture sometimes condenses on the TEC, which can be an electrical risk to the components inside your computer case. (Proper insulation usually can fix this problem.) Finally, if the heatsink attached to the hot side fails or detaches, the TEC could quickly introduce a dangerous amount of heat to the computer case because it will add the heat from both the chip and from the TEC device.

"Peltier systems can be used to achieve low temperatures, but they are more challenging to set up properly versus phase-change cooling," says Max Page, editor of FrostyTech.com. "Most people overlook the point that a 150-watt TEC may be able to achieve minus-whatever degrees unloaded. But, when mounted to a CPU, it will radiate its heat plus the heat from the CPU. In the long term, it costs less to go with a professional phase-change system, and the results are better."

Phase Change

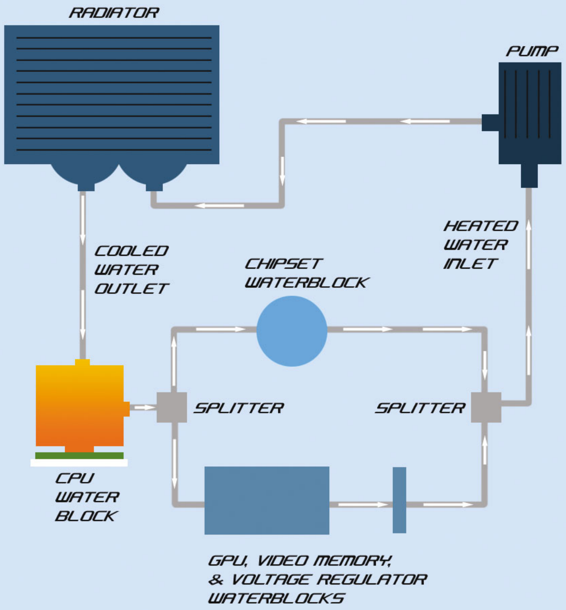
Phase change is a complex, expensive cooling system that involves a lot of different components to work properly. But it can provide extremely effective cooling for computer chips: Depending on the system, you could cool your chips below 0 degrees Fahrenheit and lower. Although, a heatpipe involves the evaporation of liquids (a form of phase change), it's not considered a phase-change cooling system. Most people are looking for more extreme cooling capabilities out of a phase-change system.

"The simplest way to achieve the lowest CPU temperatures is a phase-change

Liquid-Cooling System

In a basic liquid-cooling system (shown at right), a pump moves the fluid through the system. The liquid enters the waterblock, which pulls heat from the CPU. The liquid then moves into the radiator, carrying the heat away from the CPU. Once the liquid is in the radiator, fans (usually 120mm fans to minimize noise while maximizing efficiency) blow through the radiator, helping transfer the heat from the liquid to the surrounding air and outside the case. The pump then recirculates the now-cooled liquid back to the waterblock and starts the process again. For maximum cooling efficiency, the water needs to be constantly moving at the correct speed through the waterblock. Some pumps may offer variable speeds, but you can adjust this yourself by changing the amount and diameter of tubing you use.

If you plan to use your liquid cooling system for multiple components, you might need to employ splitters to carry the water to each component. Without splitters, the component closest to the radiator would receive the coolest water, but components farther down the line would receive water that had been heated by previous components in the line. By splitting the line, the water's temperature is more uniform for each component, providing more efficient cooling. ▲

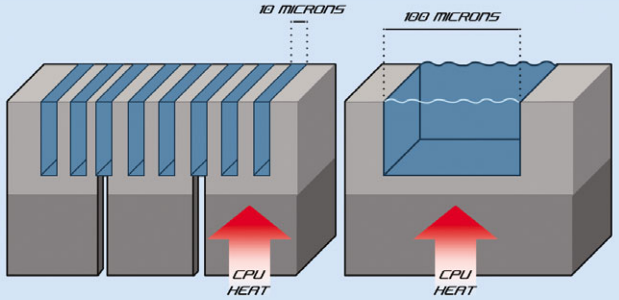


Waterblock

By using several narrow microchannels to hold the liquid (shown on the left), a waterblock has more surface area that touches the liquid than it would using one wide microchannel (shown on the right). The 10 microchannels of 10 microns in width carry the same amount of liquid as the single microchannel of 100 microns in width. But having more of the waterblock's metal surface area touching the liquid lets the waterblock to more efficiently transfer heat into the liquid.

Manufacturers typically use copper or aluminum to create a waterblock because both metals have a very good thermal conductivity (a measurement of the ability of a material to conduct heat). Copper's thermal conductivity is higher than aluminum, but it's also more expensive than aluminum.

Copper: 385-401 W/m*K (Watt/meter*Kelvin)
Aluminum: 205-237 W/m*K



Water's thermal conductivity is only about 0.6 W/m*K, but it has an advantage over metal because water can carry the heat to a specific location. Metal's thermal conductivity is better than water and air because it has more "free electrons" that facilitate the transfer of heat. ▲

cooling system," Page says. "The cost is high, but reliability and fault tolerance are good." Page adds that phase-change systems' temperatures don't normally fluctuate. (See the "Phase-Change Cooling" sidebar for more information.)

Limiting Noise

The downside to ratcheting up your cooling typically is increased noise. Some cooling systems generate less noise than others, but nearly every system needs multiple fans, which are among the biggest contributors to system noise.

Case fans typically cause more noise than any other component in your computer. CPU fans are a little quieter but still make noise. To minimize the noise, try using the largest fan possible because large fans require fewer revolutions to move the same amount of air as smaller fans. You can add items like rubber screws and washers to the fan to limit vibration noise. Vibration dampeners that adhere to the edges of the case fan can also limit the amount of fan-related noise.

Sometimes, you'll simply need a new heatsink and fan combination to eliminate noise problems.

"A new heatsink that will operate satisfactorily with a lower-speed, larger-diameter fan is really the best solution in general," Page says. "Improve the overall case cooling so internal temperatures are lower, and the CPU heatsink fan doesn't have to spin as fast."

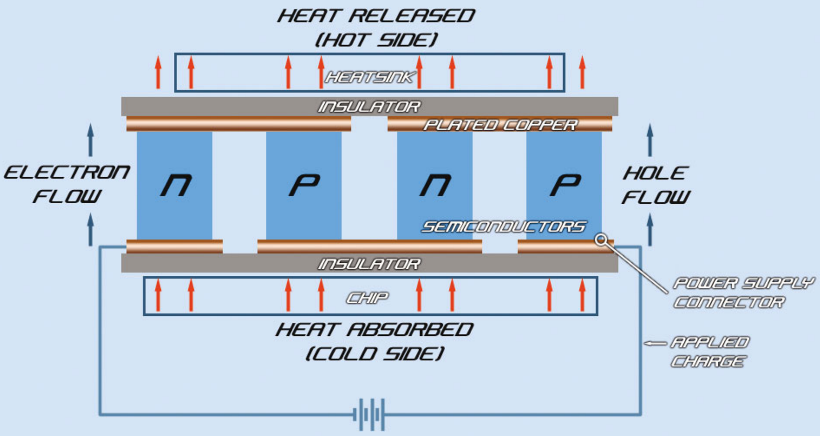
Creating a quiet system is something Bach says is his company's specialty.

"Through just a bit of intelligent design, you can have a great cooling setup and have it very pleasantly quiet," he says. "What you need to do is eliminate the small fans. Only use a case, power supply, and CPU cooler with 120mm fans, and power supplies with 120mm fans, and CPU coolers with 120mm fans.

"The good news about quiet computers is that they don't have to cost more," Bach says. ▲

by Kyle Schurman

Peltier Cooler Technology



The Peltier cooler is a complex device, requiring several components to work. With two dissimilar conductive materials on either side, designers place semiconductors between them. In most forms of Peltier cooling, plated copper serves as one material, and the power supply's connections serve as the second material.

Coupled semiconductors (usually made of bismuth telluride) are soldered between the two materials. Two types of pellets are required for maximum efficiency. Manufacturers create N-type pellets (where the carriers of the heat are the electrons and flow away from the negative charge) and P-type pellets (where the carriers of the heat are the holes between electrons and flow away from the positive charge). By arranging and pairing the pellets with plated copper, we can make the flow in both types of pellets travel in the same direction, meaning all of the heat moves in the same direction.

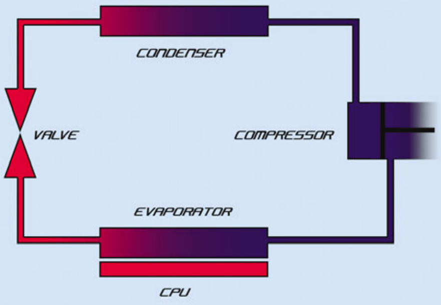
The cold side absorbs the heat from the connected chip, and the flow through the pellets carries that heat to the hot side. A heatsink attached to the hot side then releases the heat into the surrounding air.

Temperature differences between the two sides can be 60 degrees or more, which leads to a rapid heat movement from the cold side to the hot side. ▲

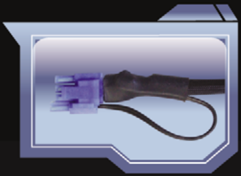
Phase-Change Technology

Many parts of the phase-change cooling system work like your refrigerator. However, while the refrigerator cools a large, enclosed space, the phase-change cooling system in a PC focuses on cooling a small chip.

Under high pressure, the coolant liquid in the system is released through a valve into a low pressure area and into the evaporator, which is attached to the CPU. Heat from the chip travels into the evaporator where the coolant liquid absorbs the chip's heat and boils, turning into a gas. The gas moves through the system back to the compressor, which applies high pressure. The pressurized gas then moves to the condenser, where it releases its heat and returns to a liquid state. The liquid returns to the valve area and begins the process again. ▲



Manual graphics card turbo power switch, combine +12V rails to give more power.
Patent No. 2020050.0668.2



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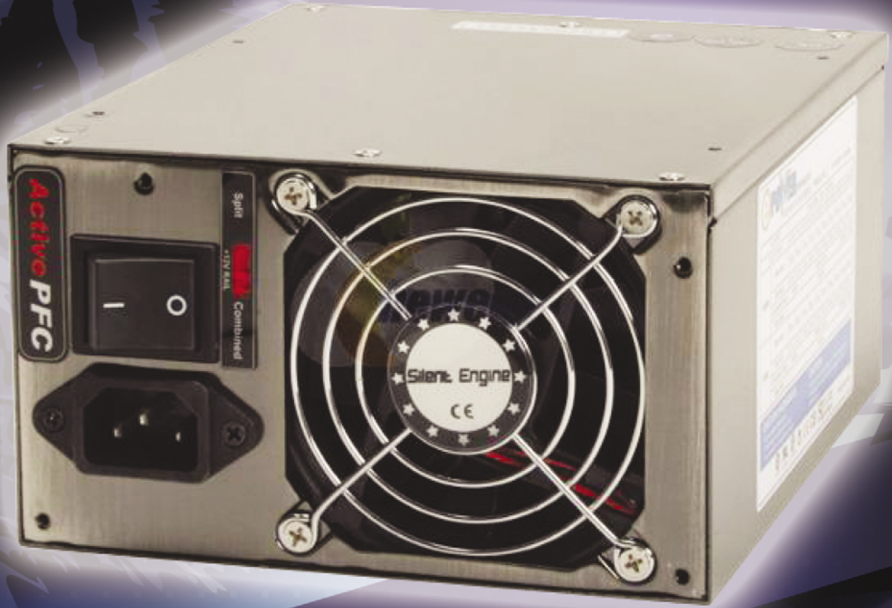

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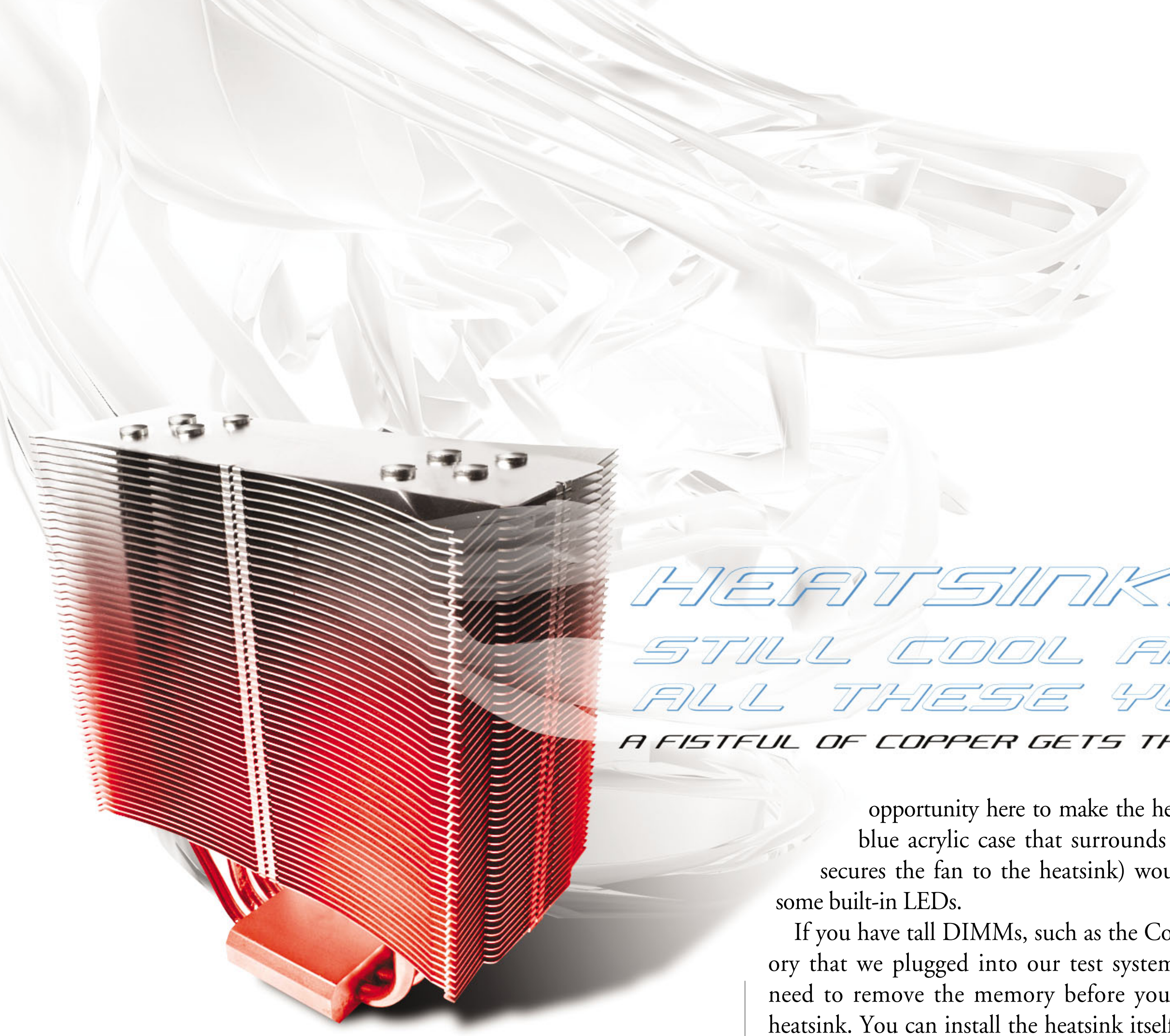


HEATSINKS: STILL COOL AFTER ALL THESE YEARS

A FISTFUL OF COPPER GETS THE JOB DONE

Fan cooling isn't dead. Sure, phase-change cooling gets plenty of attention, and there's a weird appeal to knowing that water is flowing dangerously close to your $800 graphics cards, but exotic cooling is a hassle to assemble and pulls dollars away from more important components if your budget has a limit.

Our roundup includes heavy-duty heatsinks from some of the most popular heatsink manufacturers around. We put these puppies to the test by strapping them to a 2.66GHz Intel Core 2 Quad QX6700 and running Prime95 on all four cores simultaneously. For consistency, we used the same thermal grease for all of the heatsinks. Arctic Silver provided Lumiere, a fast-setting version of its Ceramique line. We used the same test PC that handled the watercooling tests later in this issue (see "Get Your Hands Wet" on page 66 for detailed specs).

AeroCool HT-102

AeroCool's all-copper heatsink is huge and blocky, but at 92mm, the cooling fan is one of the smallest in this roundup. The fan is an eye-catcher, thanks to four built-in blue LEDs, but AeroCool missed an opportunity here to make the heatsink truly flashy. The blue acrylic case that surrounds the heatsink fins (and secures the fan to the heatsink) would look stunning with some built-in LEDs.

If you have tall DIMMs, such as the Corsair Dominator memory that we plugged into our test system, you'll find that you need to remove the memory before you attach the fan to the heatsink. You can install the heatsink itself without removing the memory, but the DIMMs will block the screwdriver when you attach the fan. Overall, this is a strong heatsink that offers solid performance for the price, whether you're overclocking or not.

Asus Silent Knight

If you're looking for a complete fan/heatsink package that offers great overclocking and has a little bling, this is the heatsink for you. The copper fins and unusual shape give the Silent Knight plenty of attitude, and the 92mm blue LED in the fan in the center of the device adds just a touch of light.

As with the Thermaltake V1, the Silent Knight pulls air through half of the fins and then pushes the air through the other half. Heatpipes lift the fins well off the copper base so that the air flows directly toward your exhaust fan. We found that setting up the heatsink is easy enough, thanks to a bracket latch that you can press with your thumb. We're glad that the installation is easy, because the thick instruction book devotes only four pages to English instructions and tiny diagrams.

HT-102
$54.99
AeroCool
www.aerocool.us
Compatibility: AMD A/754; Intel 478/LGA775
●●●●

Silent Knight
$59.99
Asus
usa.asus.com
Compatibility: AMD 939/940/AM2; Intel LGA775
●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

GeminII
$39.99
Cooler Master
www.coolermaster-usa.com
Compatibility: AMD 754/939/AM2; Intel LGA775
●●●◖

The Silent Knight is as cool as its name. It provided low temps under load and let us overclock the processor to just under the Thermalright Ultra 120 eXtreme's top clock speed. Our test system produced some great benchmark scores with the heatsink attached, including a 3DMark06 score of 12647. What makes this system a really good deal is its price for the performance.

Cooler Master GeminII

If looks are as important to you as performance, have we got the heatsink for you. The GeminII isn't the best performer in this bunch, but it is far and away the best-looking heatsink—and that's before you mount the LED fans of your choice. Unlike many new heatsinks, which generally stand their fans vertically to shuffle the hot air toward your PC's exhaust fan, the GeminII requires two horizontal 120mm fans. That's right, two giant fans, stretching from the rear of your case right up to the back of your optical drives.

Cooler Master sent us two LED Silent Fan TLF-S12-EB fans that have blue LEDs. We attached them to the heatsink's rails and then slid them into position so they didn't touch any other components (not surprisingly, there was very little wiggle room). Next, we fired up our PC and spent some time admiring the bright-blue pouring out the side panel window. Did we mention that this heatsink looks good?

Each of the TLF-S12-EBs spins at only 1,200rpm, but they offer air flow of 42.7 CFM apiece. Oddly, the test PC provided a lower 3DMark06 score than we expected but scored well in F.E.A.R., overclocked fine, and handled Prime95 without incident. If you go to LAN parties and don't mind removing the heatsink whenever you need to yank out the RAM, you'll have some serious fun with the GeminII.

Thermalright Ultra-120 eXtreme

You can't judge a heatsink by its metal, apparently. When the engineering sample of the Ultra-120 eXtreme (which should be available by the time you read this) hit our desk, we immediately noticed that it had aluminum fins. Copper is widely accepted as the better heatsink material, but this particular heatsink handles heat better than any of the copper beasts in this roundup.

We suspect that the Ultra-120 eXtreme owes much of its cooling ability to its six horseshoe-shaped heatpipes. The heatsink has a great mounting setup that includes a backplate, a collapsible bracket, and four spring-loaded screws. Thanks to this setup and the heatsink's slim body, we were able to install the heatsink easily and quickly.

Once you've installed the heatsink, you'll need to use the included wire brackets to attach a fan. Here, we ran into an interesting problem: We wanted to install Silverstone's high-powered FM121, but the heatsink bracket didn't support the fan. (Hint: if your fan attaches via long screws rather than the traditional short, fat screws, it won't support the Ultra-120 eXtreme.) Instead, we opted for Cooler Master's TLF-S12-EB, which worked out well. The Ultra-120 eXtreme proceeded to provide the best temperatures and the highest overclock in this roundup.

Thermaltake V1

Those of us who like the push-clips that secure Intel stock coolers will like the Thermaltake V1's installation setup. You can snap the four push clips into the motherboard holes with your thumb and without installing a backplate. That's helpful if you're replacing a heatsink that has a similar attachment method; you won't need to remove the motherboard when you swap heatsinks. The heatsink installs quickly and sits firmly on the processor.

We like the V's design. Two V-shaped sets of fins sandwich a 110mm blue LED fan. The fan has a max speed rating of 2,000rpm (though the mobo sensors reported that it ran at about 2,100rpm), and it has a tiny fan controller that easily slips through an open space in your I/O slot so you can slow the fan or crank it up without opening the case. That said, this feature is almost unnecessary—the fan isn't very loud when at max speed.

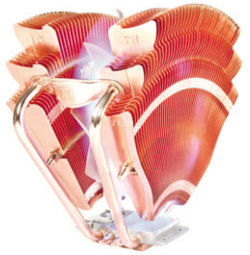
The V1 kicked off our testing with a bang, providing some of the lowest under-load temps we saw during the testing process. Although the test system couldn't quite hit 3.4GHz (it topped out at 3.35GHz and insisted on a Vcore voltage of 1.5V), the heatsink provided great cooling. The test system also scored well in 3DMark06 with the V1 attached. Don't overlook this solid heatsink.

Zalman CNPS9700 LED

Zalman's elegant heatsink designs are well-known, so it's no surprise to see that the CNPS9700 LED's power is masked by its delicate features. The heatsink is a fan of super-thin copper fins that creates a doughnut shape around the 110mm blue LED fan. Unlike the other heatsinks, which force air through their fins, the CNPS9700 LED sits at the back of the heatsink and pulls air through the fins, then forces it toward the PC's exhaust fan.

We expected this setup to make for a particularly silent heatsink, but thanks to the 2,800rpm fan, we were able to hear the heatsink loud and clear during testing. It's not loud enough to distract you when you play games or listen to music,

Ultra-120 eXtreme
$59.95
Thermalright
www.thermalright.com
Compatibility: AMD AM2; Intel LGA775
●●●●◖



V1
$62
Thermaltake
www.thermaltakeusa.com
Compatibility: AMD 754/939/AM2;
Intel LGA775
●●●●

CNPS9700 LED
$79.95
Zalman
www.zalmanusa.com
Compatibility: AMD
754/939/940/AM2
●●●●

but if you want to work in a quiet room, you'll want to use a fan controller. Our review unit's box listed the FAN MATE 2 Fan Speed Controller as an included component, but the device was not in the box.

Noise issues aside, the heatsink performs well and installs easily. A bracket uses four screws to secure the backplate, and a metal bridge screws into the bracket to hold the base of the heatsink in place. Once you've secured this bridge to the bracket, the heatsink is rock-solid.

If you tend to root for the underdog, this roundup is your kind of happy story. We took one look at Thermalright's aluminum heatsink and figured it would make a great, geeky paperweight. Instead, it provided the best cooling and best benchmark scores, all with a fan that spins at a less-than-thrilling 1,200rpm. Of course, there are several great buys here, including the Asus Silent Knight, which has more copper surface than you can shake a stick at. Overall, now's a great time to treat yourself to a cooling upgrade. ▲

(Editor's note: Subscribers can go to www.cpumag.com/cpujul07/heatsinks *for full-text reviews and product shots of the Scythe and Silverstone heatsinks.)*

by Joshua Gulick

Default Settings: 2.66GHz (1.35V core)

	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*
Intel Stock	33	36	52.1	23.2
AeroCool HT-102	33	34	49	23.6
Asus Silent Knight	30	32	44.9	22.5
Cooler Master GeminII	33	33	45.7	22.8
Scythe Katana 2	31	32	54.4	23
SilverStone Nitrogen NT06-Lite	32	35	49.8	23.6
Thermalright Ultra-120 eXtreme	30	31	40.8	22.9
Thermaltake V1	32	33	40.9	23.2
Zalman CNPS9700	38	41	42.6	23.3

Baseline Overclock: 3.2GHz (1.4V core)

	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*
Intel Stock****	33	35	54.8	23.5
AeroCool HT-102	32	34	49.7	23
Asus Silent Knight	30	32	44.6	22.6
Cooler Master GeminII	31	35	55.2	22.8
Scythe Katana 2*****	32	33	61.2	23.6
SilverStone Nitrogen NT06-Lite****	35	38	56.6	23.8
Thermalright Ultra-120 eXtreme	30	31	41.9	22.8
Thermaltake V1	31	33	41.6	23.1
Zalman CNPS9700	37	43	47.5	23

Maximum Overclock:

	Clock Speed	Vcore	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*	**3DMark06**	**SM2.0**	**HDR/ SM3.0**	**CPU**	**F.E.A.R.****	**F.E.A.R. CPU test*****
Intel Stock	2.8GHz	1.4V	33	35	54.8	23.5	12227	5043	4946	4378	86fps	138fps
AeroCool HT-102	3.4GHz	1.575V	32	32	59.7	23.1	12758	5127	5024	5267	85fps	141fps
Asus Silent Knight	3.4GHz	1.575V	32	33	55.4	23	12647	5135	5005	4996	84fps	147fps
Cooler Master GeminII	3.4GHz	1.575V	35	36	62.2	23	12042	5125	4972	3822	85fps	146fps
Scythe Katana 2	3.1GHz	1.575V	32	33	61.2	23.6	12022	5121	4953	3826	85fps	144fps
SilverStone Nitrogen NT06-Lite	2.8GHz	1.4V	35	38	56.6	23.8	10274	4842	4773	2255	87fps	139fps
Thermalright Ultra-120 eXtreme	3.45GHz	1.575V	30	32	51.3	22.8	12794	5152	5018	5309	86fps	148fps
Thermaltake V1	3.35GHz	1.5V	32	31	49.5	22.9	12777	5165	5035	5172	85fps	150fps
Zalman CNPS9700	3.4GHz	1.575V	36	47	52.9	23	12726	5138	5022	5152	86fps	146fps

* Temperature in degrees Celsius | ** F.E.A.R. run at 1,600 x 1,200 4X AA / 8X AF | *** F.E.A.R. run at 1,600 x 1,200 No AA / Trilinear AF
**** 2.8GHz | ***** 3.1GHz | Under Load = Prime 95 on all four cores for 30 minutes

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Shuttle®
Computers

Overclock to a Higher Level

Introducing the **Shuttle XPC SG33G5** desktop computer with all the punch over the competition. Powered by Intel® Core™2 Duo processor extraordinary energy-efficient multi-core technology, featuring PCI Express 16x and supporting up to 4GB of DDR2 memory.

Shuttle XPC shatters the myth that "bigger is better".

Shuttle XPC SG33G5

Model	Shuttle XPC SG33G5
Chipset	Intel® G33+ICH9
Graphics	PCI Express 16X Slot
Memory	DDR2 800
Dimensions (L x W x H)	12.2 X 7.87 X 7.28 Inch

*Sigil Games Online recommends NVIDIA graphics processors for Vanguard: Saga of Heroes TM

xpc
PC Made Modern

- 1 888 XPC 1818
- www.shuttle.com
- find XPCs at > www.us.shuttle.com/wheretobuy

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Windows Vista is either a registered trademark or trademark of Microsoft Corporation in the United States and/or other countries.

SAME OLD SPIN

CASE FANS GIVE YOUR PC A BREATH OF FRESH AIR

From the most basic rear-exhaust 12cm fans to unusual slot-mounted designs, there's a host of case-fan products out there that are both useful and eclectic. Here we've got six models—some representative of whole product lines, some one-of-a-kind items—from a clutch of manufacturers.

AzenX Blitztorm

Here's a nifty hybrid: a combination slot fan and internal case directional fan that fits in about any expansion slot. The idea is interesting, although its design quirks limit its functionality a bit.

The Blitztorm consists of two fans—a slot-mounted rear fan, with a directional fan mounted behind it. Plug it into a molex connector (it doesn't use a motherboard fan socket) and you can set the speed of both fans courtesy of a dial just above the exhaust grille on the backplate. I cranked it up to just below its maximum output—4,000rpm for the fan and 3,500 for the blower, with 30 CFM and 6 CFM of airflow, respectively—and got a fair amount of air current without significant noise (it's top-rated at 38.2dBA). Turn the knob all the way to the left and it shuts off both fans.

The second, rotating fan requires a certain amount of effort to turn into position. It locks at 90 degree positions and may feel a bit like you're trying to force it when you turn it. It only revolves on one axis, though, so it's best for blowing air at something adjacent to it, such as an undercooled GPU. Note that if you mount the Blitztorm right next to another card, you probably won't be able to angle the rotating fan without smacking into something. In fact, the manufacturer recommends turning it off before attempting to reorient it. (I came very close to mistakenly bashing the fan into a protruding capacitor on my video card when I tried to do that with the power still on!)

Rosewill RFA120L-W

Here's a good, basic system-builder's sleeve-bearing fan, the sort of thing you can use to replace a stock case fan or add to a newly-created machine. At 2,000rpm, it moves an impressive amount of air (77.26 CFM) and is noise-rated at 35.48dBA. It powers up either via a full molex connector or a motherboard plug. One potential drawback for big systems is the length of the fan's power cable: With my case and motherboard, the case fan socket was too far away, so I needed to hook up a molex extension connector to get to it. Another little omission bugged me: It has no third wire, so it can't be speed-monitored from a motherboard connector. But if you have this installed in a full-tower case, it'll move enough air that speed control is pretty much irrelevant.

AzenX Blitztorm
$24.99
AzenX
www.azenx.com
●●●

Rosewill RFA120L-W
$29.99
Rosewill
www.rosewill.com
●●●

Scythe Kama Bay
$24
Scythe USA
www.scythe-usa.com
●●◖

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Scythe NMB Silence IC Series
$19.99
Scythe USA
www.scythe-usa.com
●●●

Scythe S-Flex
$19.99
Scythe USA
www.scythe-usa.com
●●●

Thermaltake Cyclo A2426
$5.99
Thermaltake Technology
www.thermaltake.com
●●◖

The one big frill on this particular fan is the four bright-white LEDs, mounted in each corner of the fan's chassis to create a blazing illumination effect off the fan blades. Said LEDs also throw a fair amount of ambient light around the inside of your PC case, a nice partial substitute for internal lighting if you don't already have any. The clear plastic also makes it easy to line up mounting holes for installation, whether you're using screw mounts or snapping the fan into a tool-less case (as with mine). Other fan colors, including basic black and neon pink, are also available, all using the same sleeve-bearing technology.

Scythe Kama Bay

"Kama" means "scythe" in Japanese, and the "bay" in the name means this front-mounted case fan fits in either one or three 5-inch drive bays to blow air either into or within a system. People with a full-size tower and three (!) available bays can mount it vertically and use it as a 12cm front intake fan, or mount it horizontally in a drive bay and used to provide internal air circulation for, say, a hard drive cage. Unfortunately, there's no substitute front bezel that would allow you to run it as a single-bay intake fan.

The fan runs at a mere 800rpm and only moves 30.5 CFM, but it's remarkably quiet (12.8dBA). Getting it mounted, however, might pose some problems depending on your case design. My own case used toolless, snap-on mounting brackets that didn't match any of the screw holes in the product, but it fit fine in another, more standard case. To Scythe's credit, there *is* a warning about this on the packaging, so if you're interested in trying it out, be sure you can get a return on it in case you're stuck.

Scythe NMB Silence IC Series

This low-noise, 12cm case fan (other sizes from 8cm and up are also available) comes with virtually no frills but does the job nicely. Rated at 27dBA, moving 63 CFM and running at 1,600rpm, it uses a ball-bearing motor to keep things moving.

The 1,600rpm version is one of three editions of this particular fan. A 1,100rpm model and a 1,900rpm model are also available. My full-tower system did fine, temperature-wise, with the 1,600rpm fan, and with about as much noise (that is, not much) as Rosewill's product. This fan has no LEDs or other "case jewelry," but there is a power extender that lets you connect it to a full-size molex connector *and* hook it up to a motherboard connector (for speed control), as well.

Scythe S-Flex

Scythe's S-Flex fans, only available in a 12cm size, run super-quiet thanks to a fluid-bearing mechanism designed by and licensed from Sony. In fact, the S-Flex is the quietest fan in all of Scythe's lineup right now. Said mechanism uses a sealed, oil-filled chamber to reduce the amount of friction between bearing and shaft. Like the NMB Silence series, the S-Flex comes in various speeds, although they only run the gamut from 800rpm (8.7dBA) up to 1,600rpm (28dBA). The 800rpm model only moves 33.5 CFM of air; the 1,600 moves about twice that, proportionately, so you may need the higher RPM models depending on what you're building.

Like its cousin, the Scythe NMB Silence IC, there's no visual bling here. It's just a simple black fan, but it does come with a control adapter/extension cable for hooking up to a molex connector and a motherboard control socket. If you're building a media PC or other system that requires as little fan noise as possible, look into this item and its higher-speed brothers, as well.

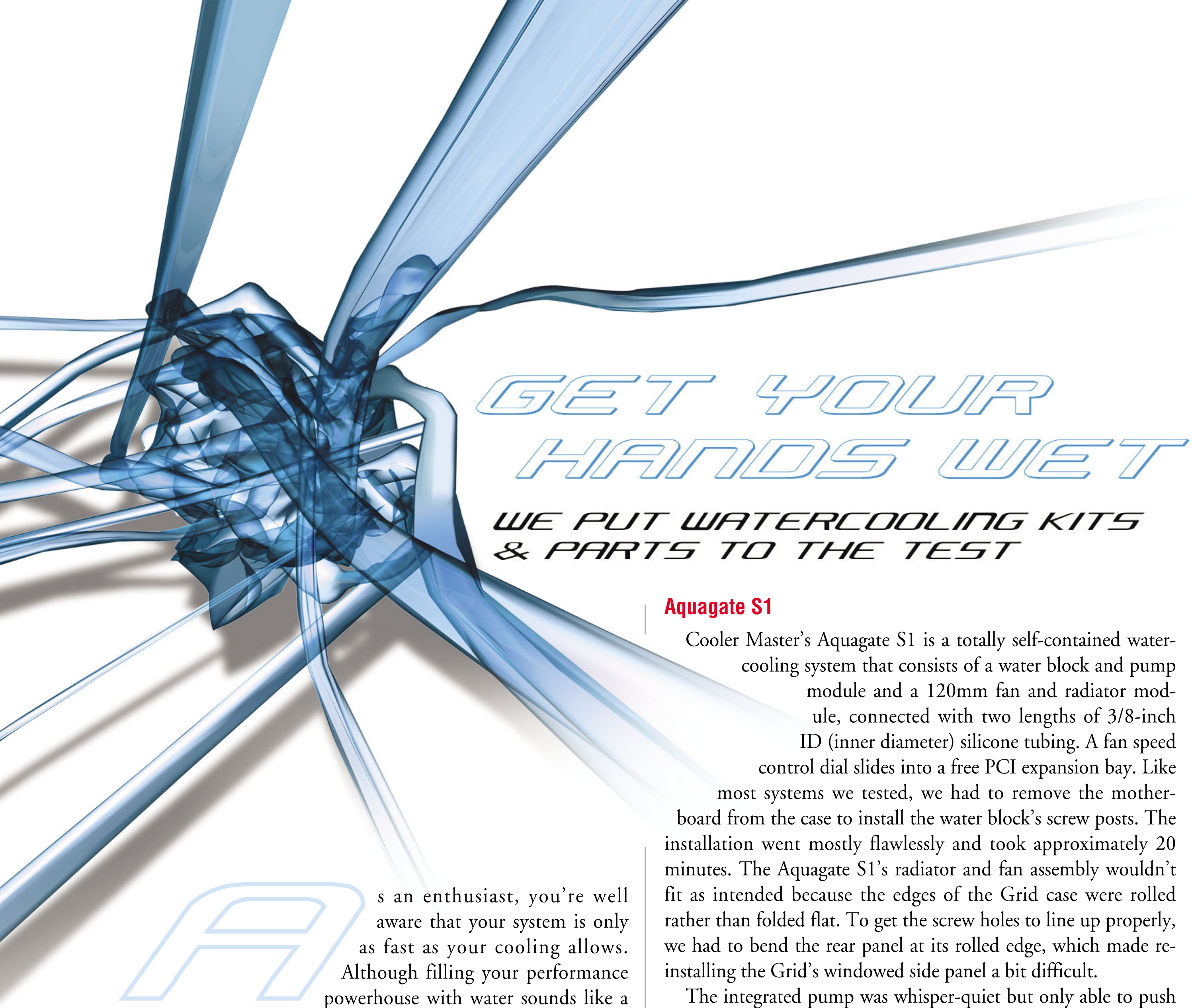
Thermaltake Cyclo A2426

An 8cm PCI slot fan with two blue LEDs, the Cyclo runs quietly (it's rated at 21dBA) and connects to the PC's power supply via a standard full-size molex connector—no motherboard fan plug, but it does include a single mounting screw if you happen to be missing one. The Cyclo only mounts by the rear bracket and doesn't actually have a tab to fit into a PCI slot like the Blitztorm. (That said, the Blitztorm is big enough to need mounting in a PCI slot; the Cyclo isn't.) A plastic grille surrounding the fan keeps it from shaving down stray fingers or loose wires.

Unless placed up against another item that desperately needs ventilation (such as a video card with an inadequate cooler), it doesn't really have a lot to justify its presence in a crowded computer case. For one, although it runs at 2,200rpm and is rated to move 22 CFM, it doesn't seem to move very much air compared to, say, the Blitztorm (especially as the Blitztorm has an adjustable speed control). When set to its highest speed, the Blitztorm pumped out a good deal more air than the Cyclo did on its one setting. ▲

by Serdar Yegulalp

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT



GET YOUR HANDS WET

WE PUT WATERCOOLING KITS & PARTS TO THE TEST

As an enthusiast, you're well aware that your system is only as fast as your cooling allows. Although filling your performance powerhouse with water sounds like a recipe for disaster, chemistry tells a rather different story. Despite water's conductive properties (water is not a good conductor of electricity, but it can carry sufficient current to destroy your components), it can absorb approximately four times the amount of energy that air can absorb before heating up. Watercooling systems can't cool your components below the ambient room temperature, but, as you'll see, the improvement over air cooling is dramatic.

We tested four all-in-one watercooling kits, constructed a fifth kit from mostly Swiftech parts, and got some hands-on time with various other watercooling components. Our test system was nearly identical to that used in the passive cooling (see page 60) and thermoelectric cooling (see page 70) articles. We used a Thermaltake Toughpower 1K watt PSU, Asus P5B Deluxe, 2.66GHz Intel Core 2 Quad QX6700, 150GB 10,000rpm Western Digital Raptor, 2GB of Corsair Dominator 1,066MHz DDR2 system memory, and a GeForce 8800 GTX for our graphics card. The case we used was the mid-tower Grid from Ultra. We left the case's single front panel fan in place but removed the rear panel fan throughout testing to accommodate kits with a rear panel-mounted radiator. We also excluded any GPU- and chipset-cooling blocks to keep our results consistent.

Aquagate S1

Cooler Master's Aquagate S1 is a totally self-contained watercooling system that consists of a water block and pump module and a 120mm fan and radiator module, connected with two lengths of 3/8-inch ID (inner diameter) silicone tubing. A fan speed control dial slides into a free PCI expansion bay. Like most systems we tested, we had to remove the motherboard from the case to install the water block's screw posts. The installation went mostly flawlessly and took approximately 20 minutes. The Aquagate S1's radiator and fan assembly wouldn't fit as intended because the edges of the Grid case were rolled rather than folded flat. To get the screw holes to line up properly, we had to bend the rear panel at its rolled edge, which made reinstalling the Grid's windowed side panel a bit difficult.

The integrated pump was whisper-quiet but only able to push coolant at 45lph (liters per hour). Another drawback of the Aquagate S1 is that there's no way to add on GPU cooling. But for the budget overclocker who doesn't want to get his hands wet, this system is an easy-to-install and affordable option.

Cooler Master's Aquagate S1 focuses on CPU cooling.

Aquagate S1
$89.99
CoolerMaster
www.coolermaster-usa.com
●●●◖

Nautilus 500

Corsair's Nautilus 500, unlike its mollusk namesake, prefers to reside outside of your PC's shell. This unit consists of an all-in-one radiator, fan, pump, and reservoir module with intake and outtake tubes running to the water block. This external watercooling system was the only kit that let us keep the motherboard in the case during the install. But our case threw us another

We topped off the Nautilus 500 with a few ounces of distilled water.

Nautilus 500
$159.99
Corsair
www.corsair.com
●●●●

Gigabyte's 3D Galaxy II comes packed in thick protective foam.

3D Galaxy II
$149.99
Gigabyte
www.gigabyte.us
●●●●

Danger Den's 4200 Kit comes with everything you need to cool your system.

Danger Den 4200 Kit
$321.03
Danger Den
www.dangerden.com
●●●●

curveball by being about a half-inch narrower than the Nautilus 500's main unit, which was meant to sit atop the case. Luckily, the unit's feet were wide enough that it could still sit securely. A PCI expansion bracket lets the coolant intake, outtake, and power cable pass through the back of the case. The box claims to include 10 feet of 3/8-inch ID tubing, but we found 8 feet instead (though still more than enough). The entire install took approximately 40 minutes.

The integrated fan has two speeds: At the low setting, it's almost inaudible, and at the high setting (74.4 CFM) it's loud enough to be distracting. The kit also supports GPU cooling blocks (single card $99.99; dual card $199.99). We particularly liked the self-sealing barbs and the quick-grip clamps on the back of the unit. This unit isn't as configurable as Gigabyte's Galaxy 3D II, but its performance is comparable and it looks a lot more elegant.

3D Galaxy II

Gigabyte has made a name for itself by bringing enthusiast features to mainstream users, and the 3D Galaxy II is no exception. This kit features an externally mounted radiator and fan, an integrated pump and reservoir, an AMD- and Intel-compatible CPU water block and fan unit, and two splitter valves that let you easily upgrade the system to include GPU cooling (sold separately). An expansion slot bracket features a fan speed dial and holes for the intake, outtake, and fan power cable. Installation took approximately 80 minutes, largely because the kit's tubing needed to be carefully measured and cut. Slowly filling the system with coolant was also a rather time-consuming process.

The 3D Galaxy II is aptly named; it's big. In particular, the splitter valves took up a lot of room in our somewhat cramped case. If you have no plans to add GPU cooling, we recommend cutting these bulky valves from the loop entirely. An abundance of blue LEDs and UV-reactive coolant add a bit of flair. The 3D Galaxy also performs well, scoring the coolest CPU temps by more than 7 degrees Celsius at our highest overclock (under load). Gigabyte has made a few aesthetic missteps with the 3D Galaxy II, but it performs well and is easy to install and use.

Danger Den 4200 Kit

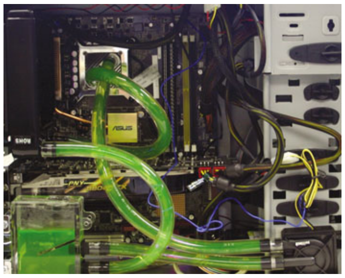
Danger Den has been making quality aftermarket PC cooling parts for some time. The 4200 kit comes with Danger Den's universal CPU water block, Black Ice Extreme radiator, DD12V-D5 pump, acrylic 5.25-inch bay reservoir, 120mm Papst fan, Maze4 GPU block, 10 feet of Tygon 1/2-inch ID tubing, MCT-5 coolant, and enough barbs and hose clamps to go around. The 4200 comes with an instructional DVD, but it covers the installation of a different kit. The pump and water blocks include basic installation guides, but there are no step-by-step instructions for the 4200 kit itself. During our testing, the 4200 kit developed a minor leak. We traced it to back to a loose reservoir cap. None of our components got wet, and a few turns of a screwdriver solved the problem.

The Tygon tubing was easy to work with, but we had to continually reference the DVD for installation tips. Also, the screw posts on the left side of the CPU water block partially obstructed the back panel, preventing us from installing the radiator and fan assembly. Luckily, Danger Den sent us a lower-profile Sunon fan, which fit perfectly. The total build took 105 minutes. Without instructions, the 4200 kit presents a barrier to the beginner, but enthusiasts will no doubt appreciate the freedom and creativity that this system affords.

Custom Swiftech System

We constructed this kit by selecting a few of Swiftech's components and cobbling them together to make a custom watercooling kit. We also used a third-party fan, tubing, and barbs (courtesy of Danger Den). Our custom kit consists of the Apogee GTX water block ($75.95), MCP350 pump ($79.95), MCR120 Quiet Power series radiator ($28.95), MCRES-MICRO reservoir ($19.95), 10 feet of Tygon 3/8-inch ID tubing ($23.50), and two 3/8-inch chrome-plated fittings ($5). Because we created the system ourselves, there were no instructions to follow. Having installed the previous systems, each part of our custom build was a fairly simple affair. Swiftech's acrylic MCRES-MICRO reservoir was

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**



Our DIY Swiftech system performed comparably to the other watercooling systems in our roundup.

Custom Swiftech System
$233.30
Swiftech
www.swiftech.com
●●●●

particularly easy to use, offering multiple mounting brackets and options to accommodate almost any position inside the case. But due to the reservoir's small size, we had to continually fill the reservoir, turn the system on and then off, fill the reservoir again, and repeat, to cycle the coolant through the CPU block and radiator. Total install time was two hours.

Our DIY Swiftech system had the lowest BIOS temps of any other system at the maximum overclock (under load). You're not going to save money by creating your own watercooling system, but if you'd rather buy your parts separately, you should be able to produce comparable results. The pride of doing it all yourself is priceless (and free).

CPU Water Blocks

TDX 775 Cooler

As its name suggests, the TDX 775 is compatible with any Intel socket 775 processor. This block is constructed of a clear Lucite top and a 100% copper 110 base that has been lapped to a high mirror shine. The block comes with the barbs and o-rings installed. The TDX 775 is available with 1/2-inch or 3/8-inch OD (outer diameter) barbs. Danger Den also pressure tests the TDX 775 to 85psi (pounds per square inch).

TDX 775 Cooler
$52.95
Danger Den
www.dangerden.com

TDX A64 Cooler

Danger Den's TDX A64 water block supports any AMD socket 754, 939, and 940 processor. Like the Intel-compatible TDX, the TDX A64 features a clear Lucite top and a high-density copper 110 base. The water block comes from the factory with a 1,200 grit lapped surface and installed 1/2-inch or 3/8-inch OD barbs and o-rings. Similar to the Intel version, the TDX A64 has been tested for leaks at up to 85psi.

TDX A64 Cooler
$52.95
Danger Den
www.dangerden.com

CPU-330

The Koolance CPU-330 is a slick-looking round CPU water block constructed of a 21k gold-plated copper base capped with anodized aluminum. The contact surface is polished to a reflective sheen. The CPU-330 is designed for use in single- or multicore configurations on almost any platform from either AMD or Intel. Barbs are sold separately, but the water block is compatible with 1/4-inch, 1/2-inch, and 3/8-inch OD varieties (with G1/4-inch threading).

CPU-330
$49.99
Koolance
www.koolance.com

Pumps

DD12V-D5 12v Pump

Danger Den's DD12V-D5 pump has the horsepower to push coolant through anything you drop into your cooling loop. At its peak, it pumps 1,200lph (liters per hour) and has a 50,000-hour MTBF (mean time before failure). The D5 features a Noryl plastic housing and is available in fixed- and variable-speed models. You can mount it to your case with the bracket or the included Velcro pads. Power comes courtesy of a 4-pin Molex plug. The unit itself has molded 1/2-inch ID plugs.

The DD12V-D5 from Danger Den is available in fixed and variable speed models.

DD12V-D5 12v Pump
$74.95
Danger Den
www.dangerden.com

DDC-12V REV2 Plus

The Danger Den DDC-12V REV2 Plus is roughly a third the size of the DD12V-D5 pump but still manages to push coolant at more than 450lph. This unit also features a Noryl plastic housing, but it is significantly quieter than the Danger Den's D5 pump. This unit also has a 50,000-hour MTBF rate. You can also adjust the voltage to throttle down the pump speed.

DDC-12V Pump
$74.95
Danger Den
www.dangerden.com

Reservoirs

Single 5 1/4-inch Bay Reservoir

Danger Den's single-bay reservoir is constructed of laser-cut, 3/8-inch thick acrylic side and back panels. This reservoir is designed to slide into a free 5.25-inch optical drive bay and features four screws for mounting a fan and pre-drilled 5mm holes for adding LEDs. The intake and outtake holes are compatible with Danger Den's High Flow fittings. A center divider also helps eliminate air bubbles. It has also been pressure leak tested.

Dual 5 1/4-inch Bay Reservoir

For more demanding watercooling setups, we recommend Danger Den's dual-bay reservoir. This unit has many of the same features as the single-bay reservoir, including laser-cut 3/8-inch thick acrylic side and back panels, predrilled 5mm LED holes, and a center divider to keep bubbles out of your system. This unit occupies two 5.25-inch drive bays. Danger Den also pressure

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

tested the Dual reservoir to ensure that it is leak-proof.

Dual 5 1/4-inch Bay Reservoir
$31.95
Danger Den
www.dangerden.com

Fillport Reservoir

For a different take on the reservoir, Danger Den offers the Fillport Reservoir. Simply bolt a Delrin Fillport ($11.95; www.dangerden.com) to the top of your case and screw this palm-sized cylinder into the Fillport's threads and then connect it to your cooling loop with a splitter. This way, you can top off your watercooling system without having to open the case. Danger Den has pressure tested the Fillport Reservoir to ensure that it's leak-free.

Fillport Reservoir
$14.95
Danger Den
www.dangerden.com

Radiators

Black Ice GTX Xtreme 240

Hardware Lab's Black Ice GTX Xtreme 240 is a glossy black heat exchanger, or radiator, that is sure to banish heat from even the most blazing rig. This brass and copper unit features a 20 fin-per-inch fin density and accommodates two 120mm fans to pull the heat out of your system. It's 11 inches tall and ideal for mounting to the front panel of your case. This unit is compatible with any G1/4-inch thread barbs.

Black Ice GTX Xtreme 240
$99.95; www.dangerden.com
Hardware Labs
www.hwlabs.com

Black Ice GTX Xtreme 360

The Black Ice GTX Xtreme 360 is for serious watercooling systems only. This massive radiator is more than 15.5 inches tall and accommodates three 120mm fans. Like the smaller Black Ice GTX 240, this unit routes the coolant through the radiator in two passes for superior cooling with minimal loss in pressure. It also uses G1/4-inch threads and includes two 1/2-inch ID barbs, courtesy of Danger Den.

Black Ice Xtreme
$124.95; www.dangerden.com
Hardware Labs
www.hwlabs.com

Thermochill PA120.2

Thermochill designed its PA120.2 radiator to pull heat from your watercooling system with the help of two 120mm fans at upwards of 130CFM. The PA120.2 is almost 12 inches tall and features a 12 fin-per-inch fin density. The unit is constructed of a brass frame and copper fins and supports G3/8-inch-threaded barbs.

Thermochill PA120.2
$119.99; www.dangerden.com
Thermochill
www.thermochill.com

by Andrew Leibman

The BIOS temps were recorded using the PC Probe II utility bundled with our P5B motherboard. Ambient temps were recorded using a temperature sensor positioned outside of the case. The sensor temp was recorded with a sensor placed directly on the processor mounting plate.

Default Settings: 2.66GHz

	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*
Cooler Master S1 Aguagate	32	35	44.8	21.8
Corsair Nautilus 500	33	40	48.4	21.9
Gigabyte 3D Galaxy II	33	37	38.4	21.8
Danger Den 4200 Kit	30	34	45.4	22.5
Swiftech DIY System	31	34	46.2	22.3

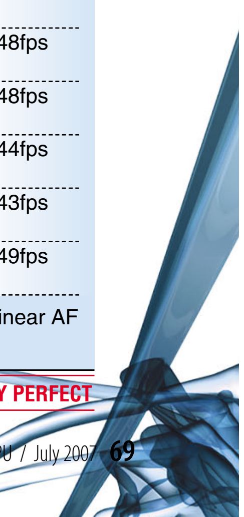
Baseline Overclock: 3.2GHz (1.4V core)

	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*
Cooler Master Aquagate S1	32	35	46.1	21.8
Corsair Nautilus 500	40	40	48.7	21.9
Gigabyte 3D Galaxy II	36	37	39.9	22.1
Danger Den 4200 Kit	33	36	49.4	22.1
Swiftech DIY System	32	34	48	22.6

Maximum Overclock:

	Clock Speed	Vcore	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*	**3DMark06**	**SM2.0**	**HDR/**	**CPU SM3.0**	**F.E.A.R.****	**F.E.A.R. CPU test*****
Cooler Master Aquagate S1	3.35GHz	1.5v	33	36	51.1	22.1	12775	5175	5044	5111	87fps	148fps
Corsair Nautilus 500	3.49GHz	1.55v	40	42	55.5	21.9	12884	5192	5063	5305	86fps	148fps
Gigabyte 3D Galaxy II	3.5GHz	1.575v	35	38	43.9	22.1	12793	5151	5017	5313	87fps	144fps
Danger Den 4200 Kit	3.5GHz	1.575v	36	38	59	22.1	12803	5147	5016	5358	85fps	143fps
Swiftech DIY System	3.5GHz	1.575v	34	35	56.4	22.4	12830	5152	5033	5366	86fps	149fps

* Temperature in degrees Celsius | ** F.E.A.R. run at 1,600 x 1200 4X AA / 8X AF | *** F.E.A.R. run at 1,600 x 1200 No AA / Trilinear AF
Under Load = Prime 95 on all four cores for 30 minutes



THERMOELECTRIC COOLERS

WHEN AIR OR WATER ALONE JUST WON'T DO

Thermoelectric coolers have been around for many years. In fact, it was all the way back in 1834 that Jean Peltier discovered that applying a DC current across two dissimilar materials, when they're arranged in a certain configuration, caused a temperature differential between them. We should also note that Jean's discovery is the reason TECs are also known as Peltiers.

At the most basic level, the CoolIT Freezone and Eliminator, Vigor's Monsoon II Lite, and Ultra Product's ChillTEC use TECs to cool a PC's processor. But none of them cool the processor directly using the TEC. Instead, they're used to augment an existing cooling apparatus in an attempt to lower operating temperatures. They're also thermally controlled to prevent too low a temperature, which eliminates condensation. Let's take a closer look at these coolers (*NOTE: prices listed are estimated street prices*).

CoolIT Freezone

We already told you about the CoolIT Freezone in the February 2007 issue of *CPU* (Vol. 7, Issue 2), but we wanted to reference it again here for a couple of reasons. First, because it's one of the more powerful hybrid TEC/watercooling devices on the market. Secondly, because of its similarities to the company's lower-priced Eliminator, which we'll show you a bit later.

The differences between the Freezone and the Eliminator are in their TEC configurations, TCMs (thermal control modules), and radiators. The Freezone has a larger radiator, while the Eliminator has a smaller radial design. The Freezone also has double the number of TEC units, and its thermal control module is a separate device that offers users finer control over performance. What these differences mean is that the Freezone can dissipate the heat from a 175W CPU; the Eliminator is rated for CPUs up to 130W.

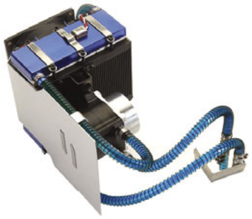
CoolIT Eliminator

The CoolIT Eliminator looks much like its more expensive counterpart, the Freezone. Both units are self-contained, hybrid water/TEC cooling devices that require minimal maintenance and are easy to install. They are both compatible with Intel- and AMD-based systems and include the necessary mounting hardware for socket 478-, T-, 939-, and AM2-based motherboards.

The Freezone and Eliminator work by actively cooling the liquid circulating through their "chiller" assemblies and don't rely solely on a fan/radiator to dissipate heat. This results in coolers that perform well under some conditions and produce only moderate noise. With either device running with their fans in low-speed mode, they are virtually silent. As you'll see in our performance chart, though, if the unit's smallish watercooling assembly is overwhelmed by the heat from a highly overclocked CPU, cooling performance suffers.

Monsoon II Lite

The Monsoon II Lite is a more affordable update to the original Monsoon II TEC cooling tower. The Monsoon II is much like a



CoolIT Freezone
$325
CoolIT Systems
www.coolitsystems.com
●●●◖

CoolIT Eliminator
$199.99
CoolIT Systems
www.coolitsystems.com
●●◖

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Thermo-Electric Cooler Performance Comparisons

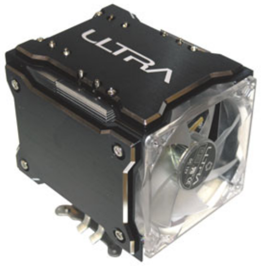
To test the cooling performance of the four TEC coolers represented here, we used a quad-core Intel Core 2 Extreme QX6700 processor coupled with an Asus P5B Premium motherboard and 2GB of Corsair Dominator RAM. Processor temperatures were monitored from within Windows using Asus' PC Probe II software, with the CPU running in stock and overclocked states both at idle and under a full processing workload. The maximum overclocked speeds in the chart are the highest frequencies the CPU was able to reliably hit while maintaining a low enough temperature to prevent heat-related throttling. ▲

standard CPU heatsink, with a copper base, heat pipes, and aluminum cooling fins. Sandwiched in between the base and heat pipes is a 40mm x 40mm TEC. In this configuration, the TEC can be used to lower temperatures, but even if it fails, the unit's full-sized heatsink and fan assembly is still able to cool the CPU.

During no-load situations, the TEC doesn't power up and the Monsoon II's heatsink is all that is necessary to cool a processor. When the CPU is under stress, the TEC kicks in to lower temperatures. The unit is compatible with LGA775 processors only, but is relatively easy to install. It requires the removal of a motherboard from its case, but the installation entails simply sliding a preassembled mounting bracket in place and tightening four spring-loaded thumbscrews to secure the unit.

Overall, the Monsoon II Lite's performance turned out to be pretty good considering its relatively low price.

Monsoon II Lite
$115
Vigor Gaming
www.vigorgaming.com
● ● ●



ChillTec
$149.99
Ultra
www.ultraproducts.com
● ● ● ◖

ChillTec

Ultra's ChillTec and Vigor's Monsoon II heatsinks are very similar due to the fact that both units are manufactured by the same company (MACS). They both have the same TEC, noise ratings, and cooling fans. The ChillTec, however, has much more substantial guards around its radiator, and it's compatible with Intel socket T and AMD socket 754/939/940/AM2 processors. The ChillTec also includes a 5.25-inch drive bay insert that displays temperature information and controls its TEC.

Like the Monsoon II, the ChillTEC uses traditional air-cooling and a TEC that's sandwiched between two copper plates. And each plate has heat pipes connected to it that lead to a large radiator. The ChillTEC's control unit does not supply power to the unit's TEC until the processor reaches a certain temperature, at which point power is applied to the TEC and the CPU is cooled down. Noise levels and performance between the Monsoon II and ChillTEC were similar throughout testing, but the ChillTEC's beefier heatsink shroud, slick drive bay insert, and universal mounting hardware make it a more attractive option in our opinion. ▲

by Marco Chiappetta

Default Settings: 2.66GHz

	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*
Vigor Monsoon II Lite	46	64	52	23
Ultra ChillTEC	44	62	52	24
CoolIT Eliminator	41	57	38	25
CoolIT FreeZone	34	49	37	24

Baseline Overclock: 3.2GHz

	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*
Vigor Monsoon II Lite	45	67	54	25
Ultra ChillTEC	44	66	54	24
CoolIT Eliminator	45	64	39	24
CoolIT FreeZone	38	56	38	24

Maximum Overclock:

	Clock Speed	Vcore	BIOS Temp (Idle)*	BIOS Temp (Under Load)*	Sensor Temp (Under Load)*	Ambient Temp*	**3DMark06**	**SM2.0**	**HDR/ SM3.0**	**CPU**	**F.E.A.R.** CPU**	**F.E.A.R. test*****
Vigor Monsoon II Lite	3.43GHz	1.45v	50	77	61	24	12793	5165	5016	5274	86fps	149fps
Ultra ChillTEC	3.43GHz	1.45v	49	75	61	23	12756	5115	5042	5244	86fps	151fps
CoolIT Eliminator	3.43GHz	1.45v	47	77	41.5	24	12785	5152	5034	5236	86fps	150fps
CoolIT FreeZone	3.49GHz	1.5v	39	63	39	25	12869	5173	5051	5358	87fps	154fps

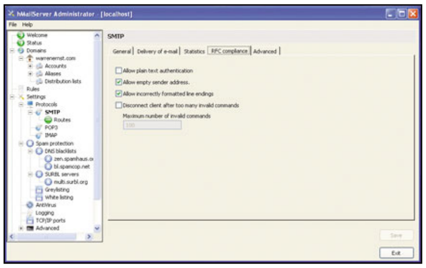
* Temperature in degrees Celsius | ** F.E.A.R. run at 1,600 x 1,200 4X AA / 8X AF | *** F.E.A.R. run at 1,600 x 1,200 No AA / No AF
Under Load = Prime 95 on all four cores for 30 minutes

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

The Bleeding Edge Of Software

Inside The World Of Betas

hMailServer 4.4 Build 269 (Unstable)



☐ Allow plain text authentication
☑ Allow empty sender address.
☑ Allow incorrectly formatted line endings
☐ Disconnect client after too many invalid commands
Maximum number of invalid commands: 100

Official Product Name: hMailServer
Version # Previewed: 4.4 Build 269 (Unstable)
Publisher: Halvar Information
Developer & URL: Halvar Information, www.hmailserver.com
Product URL: www.hmailserver.com
ETA: Q3 2007
Why Should You Care?: Becoming your own ISP with Windows gets easier with hMailServer.

When it comes to hosting a Web site on a Windows PC, there are some obvious choices, but things get murkier when it comes to running an email server. While there are many robust commercial mail servers for Windows and lots of free mail servers for Linux, there haven't been many robust free mail servers for Windows. One of the few is hMailServer, which has just released an "unstable" beta build that we've found to be just fine for day-to-day use and has the guts to run with the "big guys," thanks in part to its vibrant user community.

By itself, hMailServer is just that: a mail server. It supports SMTP, POP3, and IMAP, and that's it. Meaning that if you want a Web mail or remote administration interface, then it's up to you to install a Web server, PHP or Perl, and whatever scripts you want. Odds are a little searching and configuring will leave you with a setup that does everything you could ever want.

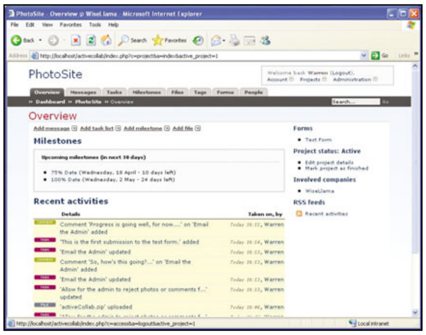
Web mail notwithstanding, hMailServer offers a lot. There's simple setup and configuration via conventional Windows dialog boxes. There's built-in whitelisting, graylisting, and hooks into the major anti-spam Web sites such as SpamHaus. It can directly utilize ClamAV for antivirus scanning or use almost any other executable of your choice with tweaking. By checking out the user forums, you can learn how to (relatively) easily integrate SpamAssasin, Squirrel-Mail, or integrate SSL logins.

hMailServer even has some touches the other guys miss, such as mailing list management, built-in account and data backup and restore, and remote mail collection from other POP3 accounts.

The current beta adds relatively few features, instead focusing on bug fixes and general streamlining. As such, it's worth a serious look if you're interested in managing your own mail queues in Windows. ▲

by Warren Ernst

activeCollab 0.7.1



Upcoming milestones (in next 30 days)

- 75% Date (Wednesday, 18 April - 10 days left)
- 100% Date (Wednesday, 2 May - 24 days left)

Details	Taken on, by
Comment 'Progress is going well, for now....' on 'Email the Admin' added	Today 18:55, Warren
'This is the first submission to the test form.' added	Today 18:54, Warren
'Email the Admin' updated	Today 18:53, Warren
Comment 'So, how's this going?...' on 'Email the Admin' added	Today 18:53, Warren
'Email the Admin' updated	Today 18:53, Warren
'Allow for the admin to reject photos or comments f...' updated	Today 18:53, Warren
'activeCollab.zip' uploaded	Today 18:46, Warren

- Test Form
- Edit project details
- Mark project as finished
- WiseLlama
- Recent activities

Official Product Name: activeCollab
Version # Previewed: 0.7.1
Publisher: Ilija Studen,
Developer & URL: Ilija Studen, www.activecollab.com
Product URL: www.activecollab.com
ETA: Q3 2007
Why Should You Care?: Host your own BaseCamp; what could be better?

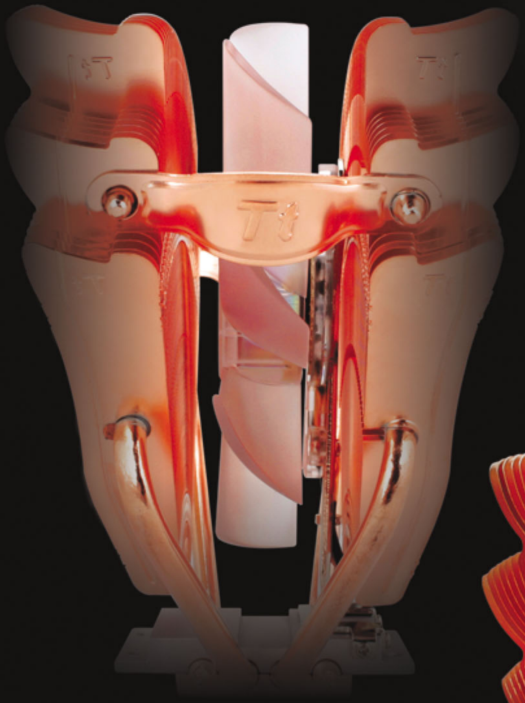
If you're working on a project with one or more other people, then one of the many online collaboration sites, of which BaseCamp is most famous, is probably something you could really use to keep your little workgroup humming efficiently. BaseCamp, however, is a commercial site that charges you for the greater usage typical of large workgroups with many projects. activeCollab was originally written as a sort of "Open Source BaseCamp clone" that anyone with a Web server could use without limitations, but it has grown into something that's starting to come into its own.

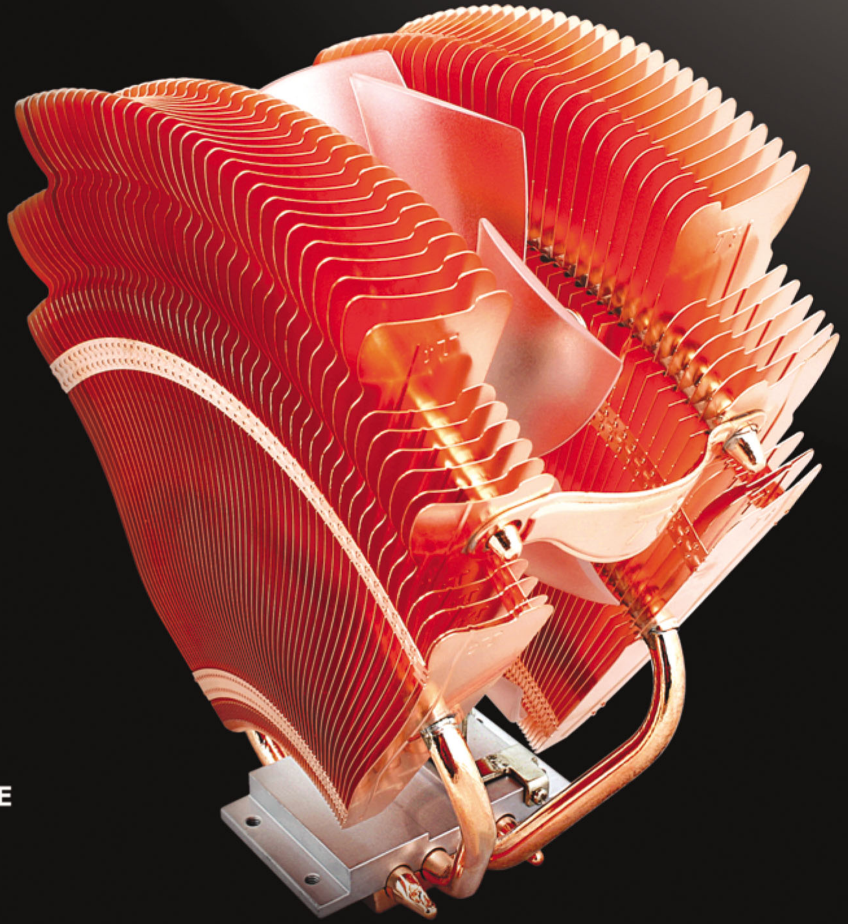
To be sure, "BaseCamp clone" refers mostly to functionality, as the current version lacks all the spiffy AJAX/JavaScript that makes BaseCamp so intuitive and fast. Still, if you maintain a speedy Web server, activeCollab doesn't seem much slower, and its open-source history has allowed its users to add new features that BaseCamp lacks, such as adding comments to To Do items.

activeCollab includes most of what BaseCamp does, such as To Do Lists, dated Milestones, File Storage, and threaded Messages with comments. It adds tagging, but it lacks any sort of calendar grid to represent schedules (though it does export iCal URLs for Google Calendar and Sunbird), chat rooms, or a "WriteBoard" for creating collaborative online documents. The beauty of activeCollab is that it runs on your server, meaning you can add your own chat rooms and Web calendars if you like.

Version 0.7.1 is among the last releases before the magic "1.0," which is when the licensing model will require a modest payment for new features. On the other hand, 1.0 will have a real plug-in API, allowing easy development of new features by the already active user community, and one assumes paying customers will have more say over how activeCollab develops. The current version is stable and useful. ▲

by Warren Ernst





V1

ALL COPPER PERFORMANCE
EXTREMELY SILENT FAN
CONTEMPORARY DESIGN

The Thermaltake V1 cooler. Admire the slight glow it emits from the solid copper design and LED fan, this polished work of art seems like it belongs in an art museum; almost a shame for someone to not have a side window. However, don't let the elegance fool you because underneath the beauty is the cooling beast. Made fromsolid copper and a high performance fan with full-range speed controller, this cooler's performance is only rivaled by its style. Open-frame 11CM fan eliminates air rebounding noise that making it virtually silent during operation. Thermaltake V1, taking CPU cooling to a new height.

Thermaltake®
COOLall YOUR LIFE

www.thermaltakeusa.com

COMPUSA We got it. We get it. RadioShack. You've got questions. We've got answers. MICRO CENTER Fry's Electronics Outpost.com newegg.com ZipZoomfly.com TigerDirect.com PC CLUB Buy.com

UP TO SPEED

Upgrades That'll Keep You Humming Along

The arrival of Vista in the marketplace prompts updates for a host of familiar programs like WinZip and more frequent driver tweaks for most devices and graphics cards. The Microsoft-averse among us will want to look at the new Thunderbird email client or Netscape's latest browser iteration for good alternatives to Outlook and IE7, respectively.

Software Updates

CCleaner 1.39.502

One of the best and least expensive (i.e. free) file cleanup tools has rewritten its secure deletion code to run two times faster. There have been performance improvements for deleting the Internet cache, as well. Bugs involving Recycle Bin cleaning and overflow errors with large numbers of files have been fixed.

www.piriform.com

Creative Media Explorer 6.60.12 Software Pack

For the Zen Vision W player, this update to the full suite of support software for the device makes the Explorer, CD ripper, sync manager, and video converter compatible with Vista.

www.creative.com

Mozilla Thunderbird 2.0

Mozilla takes aim at Outlook in this major update of the free and open-source email client. Message tags for more flexible mail organization, customized folder views, and folder summary pop-ups are among the new features. There is easier access to Gmail and .Mac accounts, more informative new mail alerts, and custom columns for the message list.

www.mozilla.com

Netscape Browser 8.1.3

Mainly security fixes in this release of the veteran Web browser. Netscape has bundled spyware and adware protection and a Security Center console that gives you an at-a-glance look at the shields that currently are active.

browser.netscape.com/ns8

QuickTime Alternative 1.81

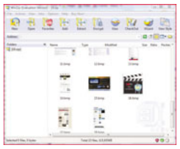
The alternative player is based on QT 7. This version updates the CoreAVC and adds Gabest MP4 splitter. The QT ActiveX control for Internet Explorer is listed as separate component in the installation.

www.codecguide.com

WinRAR 3.70 Beta

The archiving/compression program that handles those RAR files along with other compressed formats has several bug fixes here. A faulty switch in Unrar.exe and problems handling packages with malformed filename extensions has been fixed.

www.rarlab.com



WinZip 11.1

The iterative upgrade for the recent version upgrade of this compression classic updates for Vista. You get a Vista-like toolbar and icons and a Vista Explorer interface. This upgrade supports both 64-bit and 32-bit versions.

www.winzip.com

VMWare Player 2.0.0.44426 Beta

The free software that enables virtual machines on Windows or Linux PCs gets experimental support for two-way Virtual SMP, drag-and-drop file sharing between main and virtual machines, and new support for both Vista and USB 2.0. There is also expanded host and guest OS support that now includes Vista, Red Hat Enterprise Linux 5, Ubuntu 3.10, and others.

www.vmware.com

ZoneAlarm Security Suite 7.1.028.000 Beta

The full-featured security solution fixes a broken spyware scan activation button and mislocation of backed up XML files. The Help system has been updated, and a Vista driver installation problem has been fixed.

www.zonelabs.com

Driver Bay

ATI Catalyst 7.4 For Vista

ATI adds the Avivo Video Converter for the 32-bit version of Vista. The 7.4 drivers promise OpenGL performance gains of about 15% for all Radeon X1000 cards.

ati.amd.com

Creative X-Fi Series Vista Driver 2.13.0012

For the line of X-Fi cards running on Vista 32-bit and 64-bit, the drivers have unspecified effects but they include Vista-compatible versions of the Crystalizer and CMSS 3D synthesizers, MIDI playback, and EAX Effects. They do not yet support Dolby Digital and DTC decoding, DVD-Audio, DirectSound-based EAX games, or 6.1 speaker mode.

www.creative.com

Microsoft Habu Driver/Firmware 2.01

For Microsoft's gaming mouse (made in partnership with Razer), the new driver works across all recent Windows versions, including Vista, and fixes a bug that kept the mouse stuck in the 125Hz polling rate.

www.razersupport.com

Nvidia GeForce ForceWare For Vista

For most GeForce models these new drivers have versions for 32-bit and 64-bit Vista installations. They increase 3D performance, add SLI profiles for some recent games, and support PureVideo HD. The Nvidia Control Panel also has a more usable interface.

www.nvidia.com

by Steve Smith

Registry Editors

Clean Up Your PC's Code

When you install a program on your computer, you don't just copy a single file to your hard drive, but a handful of files. When that program runs, not only does it need to know where to find all of these additional files, but it also needs to know what additional equipment your computer may have, such as a printer, sound card, or joystick.

Programs could scan your computer to find this information each time they run, but it's more efficient to store this information in a special file instead. With early versions of Windows, every program had to create a separate file to store this information (called an INI file), but current versions of Windows store all program information in a single file called the Registry.

The biggest advantage of storing all program information in a single file is that there's much less chance of accidentally deleting, modifying, or losing multiple INI files. The biggest disadvantage is that if this single Registry file gets deleted or corrupted, your computer can run erratically or even fail completely.

So, periodic Registry maintenance is important to optimal performance, but you may not always want to spend the time and effort to do it manually. That's where Registry cleaner apps come in.

I tested four commercial Registry programs (Registry Mechanic, jv16 PowerTools, Advanced Registry Optimizer, and System Mechanic) along with two freeware programs (CCleaner and TweakNow Registry Cleaner) on an Athlon 64 computer running a virtual copy of Windows 2000 (using VMWare 4.5) and a virtual copy of Windows XP (using Virtual PC 2004). By making multiple copies of the virtual computer files, I could test each Registry program on identical configurations.

Although I recorded the number of errors each program found, a program that finds 200 errors might not necessarily be better than another program that only found 50 errors. The problem is how each program counts an error. If a single program left three chunks of data in the Registry, one program might consider that one error while another might consider it three errors.

Another problem is what each Registry cleaner considers an error. Some programs store temporary data in the Registry, such as a list of the last four recently opened files. This type of information will often get deleted by the program that created it anyway, but some Registry cleaners may flag this as an error, which can help boost their total error count to look more impressive.

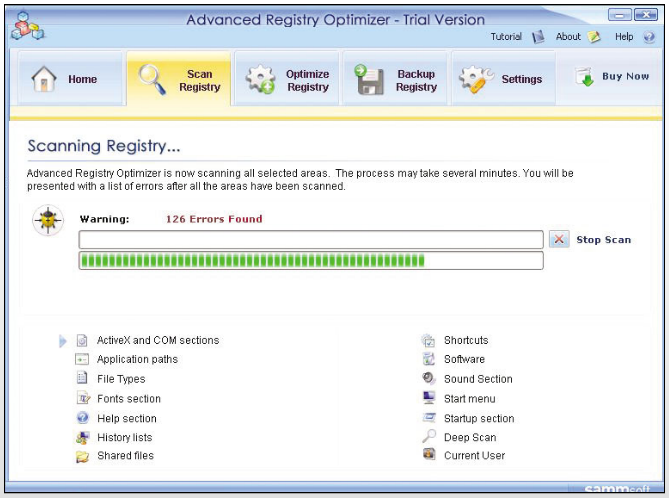
If you're running Vista, your choice of Registry optimizers is more limited. Out of this group of programs, only two (System Mechanic 7 and TweakNow Registry Cleaner) claim full compatibility with Vista. The remaining programs either didn't support Vista at all (Advanced Registry Optimizer) or only offered partial support. Vista users must contact the software publishers directly to ensure that the programs will work on their specific version of Vista.

Perhaps the biggest question regarding Registry cleaners is how important they are. Put simply, Registry cleaners should be a standard feature of Windows. The more you use your computer, the more bloated and scrambled your Registry will become. If your computer feels noticeably slower than when you first bought it, your Registry likely needs cleaning. Because Windows doesn't come with a built-in Registry cleaner, you'll have to

Registry Editors Compared

Program	Windows 2000 Errors Caught	Windows XP Errors Caught	Vista Compatible?	Price
Advanced Registry Optimizer	298	181	No	$29.50
CCleaner	104	91	Partial compatibility with 64-bit versions	Free
jv16 PowerTools	334/966 (conservative/ aggressive mode)	74/420 (conservative/ aggressive mode)	32-bit versions only	$29.95
Registry Mechanic	117	67	Limited	$29.95
System Mechanic 7	Unable to install	4	Yes	$49.95
TweakNow RegCleaner	23/30 (beginner/ expert mode)	4/24 (beginner/ expert mode)	Yes	Free ($26.95)

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**



Scanning Registry...

Advanced Registry Optimizer is now scanning all selected areas. The process may take several minutes. You will be presented with a list of errors after all the areas have been scanned.

Warning: 126 Errors Found

Advanced Registry Optimizer
$29.50
Systweak
www.systweak.com
●●●
Windows 98/Me/NT/2000/XP

rely on one of the many third-party options listed here instead.

Advanced Registry Optimizer

Advanced Registry Optimizer offers a simple user interface that offers three clearly marked options: Scan Registry, Optimize Registry, and Backup Registry. When scanning the Registry, the program gives you the option to choose which parts of the Registry to scan and which to exclude.

Perhaps more useful is Advanced Registry Optimizer's scheduling feature, with which you can automatically clean and optimize your Registry daily or weekly or on a specific date and time. By setting a schedule, you can have the software periodically maintain your Registry without manually running the program yourself.

After scanning and cleaning the Registry, the Optimize Registry option defragments it. Unlike most Registry cleaners that prompt you to back up your Registry before scanning or defragmenting it, this app forces you to back up your Registry manually. If you neglect to back up your Registry and it gets corrupted, your computer may fail to boot up.

Despite the minor problem of backing up your Registry periodically, this program proved simple, fast, and easy to use. On my Windows 2000 virtual machine, the app caught 298 errors, while on the Windows XP virtual machine, it caught 181 errors.

You can download and try Advanced Registry Optimizer for free, although the free version will only correct the first 20 errors it finds in your PC. Overall, Advanced Registry Optimizer is a solid choice for the average user who wants a simple and automated solution to maintaining the Registry.

CCleaner

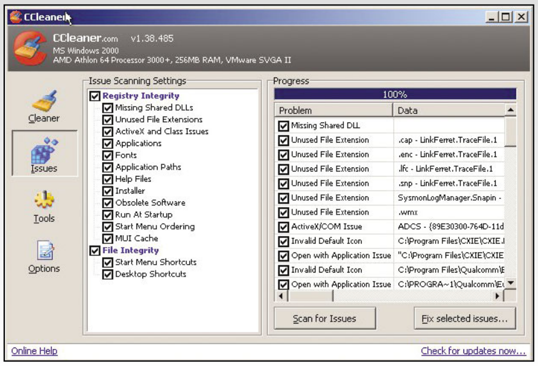
CCleaner is a free program designed for people who don't know much about computers and don't want to learn.

Scanning the Registry for errors is as simple as clicking a single button. However, before scanning your Registry for errors, the app lets you pick and choose the type of errors you want to scan for and ignore, such as missing ActiveX or DLL entries. Unfortunately, the type of person most likely to benefit from this app is probably the type of person who doesn't know (or care) what ActiveX and DLL entries are in the first place.

When you click a simple Fix button, CCleaner offers to back up the Registry, an important safety feature in the unlikely event that Registry gets corrupted. After this optional backup step, the app checks for errors and offers to remove them individually or all at once.

Strangely, on my Win2000 virtual machine the program initially found and fixed 58 errors, but running CCleaner a second time uncovered an additional 45 errors. Then the app complained that one last error still remained. Only after scanning and fixing the Registry three times did the software finally claim the Registry was error-free. (On the WinXP virtual machine, the app found 65 errors. Immediately after fixing these problems, it uncovered 17 more errors. The third time, the app found 9 errors.)

Unlike other programs in this review, CCleaner only removes Registry errors but does not compact the Registry to



CCleaner.com v1.38.485
MS Windows 2000
AMD Athlon 64 Processor 3000+, 256MB RAM, VMware SVGA II

☑ Registry Integrity
  ☑ Missing Shared DLLs
  ☑ Unused File Extensions
  ☑ ActiveX and Class Issues
  ☑ Applications
  ☑ Fonts
  ☑ Application Paths
  ☑ Help Files
  ☑ Installer
  ☑ Obsolete Software
  ☑ Run At Startup
  ☑ Start Menu Ordering
  ☑ MUI Cache
☑ File Integrity
  ☑ Start Menu Shortcuts
  ☑ Desktop Shortcuts

100%

Problem	Data
☑ Missing Shared DLL	
☑ Unused File Extension	.cap - LinkFerret.TraceFile.1
☑ Unused File Extension	.enc - LinkFerret.TraceFile.1
☑ Unused File Extension	.lfc - LinkFerret.TraceFile.1
☑ Unused File Extension	.snp - LinkFerret.TraceFile.1
☑ Unused File Extension	SysmonLogManager.Snapin -
☑ Unused File Extension	.wmx
☑ ActiveX/COM Issue	ADCS - {89E30300-764D-11d
☑ Invalid Default Icon	C:\Program Files\CXIE\CXIE.I
☑ Open with Application Issue	"C:\Program Files\CXIE\CXIE
☑ Invalid Default Icon	C:\Program Files\Qualcomm\E
☑ Open with Application Issue	C:\PROGRA~1\Qualcomm\Eu

CCleaner
Free
Piriform Ltd.
www.ccleaner.com
●●◖
Windows 95/98/2000/XP/Vista
(Partial compatibility with 64-bit versions of Vista)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

make your computer run faster. If you just need to fix minor Registry errors and want a free and simple program to do it, CCleaner does the job, although it may require running the program multiple times to root out all the Registry errors that it should have caught on the first pass.

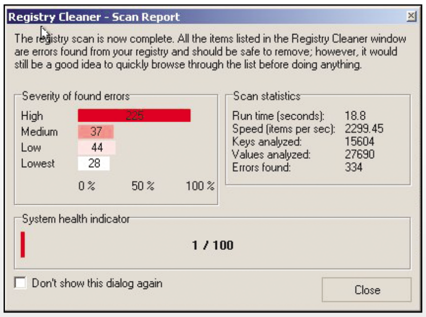
jv16 PowerTools

For those who want to dig into the guts of their Registry, the best program we reviewed was jv16 PowerTools. Unlike simple Registry cleaners that automate the optimization process, this app provides a handful of separate tools for tackling specific Registry problems.

The Registry Backup tool makes a copy of your Registry so you can restore it to a previous state. The Registry Monitor tool keeps track of changes made to the Registry. The second that something in your Registry changes, this tool will let you know.

The Registry Information tool provides detailed information about the current data stored in the Registry. While information such as the number of strings and binary values stored in the Registry or the size of the Registry may confuse novices, this information can help you better understand what your Registry contains.

The Registry Finder and Find & Replace tools let you search for specific values in the Registry and replace them. This can simplify the process of manually editing the Registry, provided you know what to look for and how to change it.



The registry scan is now complete. All the items listed in the Registry Cleaner window are errors found from your registry and should be safe to remove; however, it would still be a good idea to quickly browse through the list before doing anything.

Severity of found errors

High	225
Medium	37
Low	44
Lowest	28

Scan statistics

Run time (seconds):	18.8
Speed (items per sec):	2299.45
Keys analyzed:	15604
Values analyzed:	27690
Errors found:	334

System health indicator
1 / 100

☐ Don't show this dialog again

jv16 PowerTools
$29.95
Macecraft Software
www.macecraft.com
● ● ● ◖
Windows 98 through Vista
(32-bit versions only)

The Registry Cleaner tool offers a conservative and an aggressive mode for cleaning your system's Registry. The conservative mode only identifies and removes those errors that will most likely not affect your computer. The aggressive mode identifies and removes Registry data that might possibly affect currently installed programs.

When run on my Win2000 virtual machine, the conservative mode caught 334 errors, while the aggressive mode snared 966 errors. Removing all 966 errors caught in the aggressive mode did not adversely affect the computer in any way. (On the WinXP virtual machine, the tool found 74 errors in conservative mode, and in aggressive mode, Registry Cleaner found 420 errors.)

If the Registry Cleaner fails to do its job, you can always resort to the Registry Manager tool, which lets you manually edit and modify your Registry. Manual Registry editing can be dangerous if you make a mistake, so this tool is definitely for experienced users only.

Once you clean out the Registry, you can use the Registry Compactor tool to reorganize it to make it smaller so your computer runs faster. Because jv16 PowerTools has so many tools to examine, edit, modify, and optimize the Registry, it's definitely not for novices.

However, if you're a technical user or someone unafraid of digging into your Registry with one of the most powerful Registry tools on the market, then jv16 PowerTools is for you.

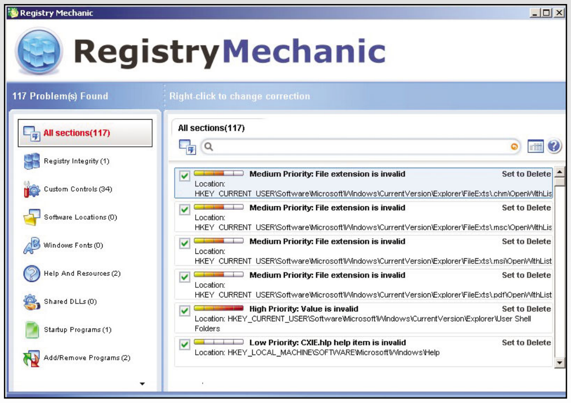
Registry Mechanic

Registry Mechanic provides a simple user interface that isolates the technical details of Registry keys and values. The app offers a simple, one-click user interface for starting a Registry scan to search for errors.

On WinXP, Registry Mechanic can automatically create a restore point, which can be more useful than a backup of the Registry. An ordinary backup of the Registry can be rendered useless if your original Registry gets corrupted, preventing you from booting up (and accessing the backup of the Registry) in the first place.

To maintain the Registry on a regular basis, Registry Mechanic offers two features: a Registry monitor and a custom scanning feature. The Registry monitor notifies you immediately the moment the Registry changes. That way you'll know when you might need to scan and repair your Registry again.

The custom scanning feature lets you define which parts of the Registry to scan (which can require some knowledge of the Registry), along with letting the software scan the Registry automatically every time you boot up your computer. Obviously this process slows down the overall bootup time, but it ensures that your Registry will always be as efficient as possible.



117 Problem(s) Found

☑ Medium Priority: File extension is invalid — Set to Delete
Location:
HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\FileExts\.chm\OpenWithLis

☑ Medium Priority: File extension is invalid — Set to Delete
Location:
HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\FileExts\.msc\OpenWithLis

☑ Medium Priority: File extension is invalid — Set to Delete
Location:
HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\FileExts\.msi\OpenWithList

☑ Medium Priority: File extension is invalid — Set to Delete
Location:
HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\FileExts\.pdf\OpenWithList

☑ High Priority: Value is invalid — Set to Delete
Location: HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\User Shell Folders

☑ Low Priority: CXIE.hlp help item is invalid — Set to Delete
Location: HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\Help

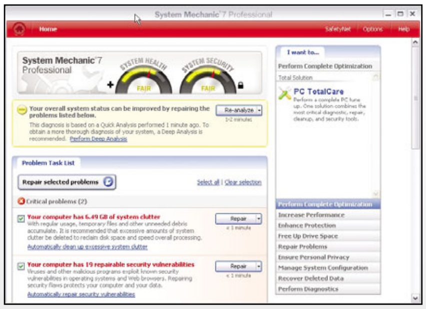
Registry Mechanic
$29.95
PC Tools Software
www.pctools.com
● ● ●
Windows 98/Me/2000/XP
(Limited support for Vista)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

On my Win2000 virtual machine, Registry Mechanic found 117 errors, and on the WinXP virtual machine, it found 67 errors. After cleaning the Registry, the app can also compact it to make it smaller and more efficient.

Using this program is simple and foolproof, making it especially useful for less experienced computer users for maintaining their Windows Registry.

System Mechanic 7



Perform a complete PC tune up. One solution combines the most critical diagnostic, repair, cleanup, and security tools.

Your overall system status can be improved by repairing the problems listed below.

This diagnosis is based on a Quick Analysis performed 1 minute ago. To obtain a more thorough diagnosis of your system, a Deep Analysis is recommended. Perform Deep Analysis

☑ Your computer has 6.49 GB of system clutter

With regular usage, temporary files and other unneeded debris accumulate. It is recommended that excessive amounts of system clutter be deleted to reclaim disk space and speed overall processing.

Automatically clean up excessive system clutter

☑ Your computer has 19 repairable security vulnerabilities

Viruses and other malicious programs exploit known security vulnerabilities in operating systems and Web browsers. Repairing security flaws protects your computer and your data.

Automatically repair security vulnerabilities

System Mechanic 7
$49.95
Iolo Technologies
www.iolo.com
● ● ◖
Windows 98/Me/XP/Vista

System Mechanic includes a collection of general utilities, including a Registry optimizer. Unfortunately, testing this program proved impossible on my Win2000 virtual machine. Unlike other programs, installing System Mechanic immediately requires an Internet connection to download updates. Oddly enough, this update process only works with Internet Explorer 6 or 7 and not with any other browser such as Firefox. On my Win 2000 virtual machine, IE 6 refused to install. As a result, System Mechanic wouldn't install.

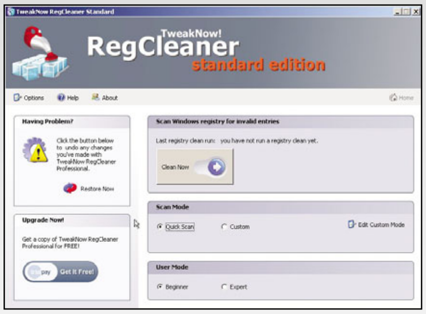
I did succeed in installing System Mechanic on the WinXP virtual machine, where the app only found 4 errors. When uncovering Registry problems, the program helpfully sorts the errors by category, such as invalid installer data in the Registry. By categorizing errors, System Mechanic helps you see which Registry errors tend to occur most often on your system.

After identifying errors, System Mechanic gives you the option to fix all the errors or just the ones you select. Most people will likely choose to remove all the errors, although it's possible (though unlikely) that the app could remove a valid Registry entry by mistake. If this does occur, System Mechanic makes a backup of your Registry that you can restore with a click of the mouse. To finish cleaning the Registry, the program can also compact or defragment the Registry to make your computer faster.

Beyond the peculiar installation process that requires an Internet connection before it can install on your PC, System Mechanic proved easy to use with an interface that isolates the details of the Registry from the user. The application is more than a Registry cleaner, which accounts for its higher price, so if you need additional system utilities along with a Registry cleaner, System Mechanic is a good choice. If you already use a set of utilities, then you'll probably want a less-expensive, dedicated Registry cleaner instead.

TweakNow RegCleaner

TweakNow offers two RegCleaner versions: a free and a $26.95 commercial version. The main difference is that the commercial version can defragment and compact the Registry, while the free version cannot. For this review, I used the free version only.



Click the button below to undo any changes you've made with TweakNow RegCleaner Professional.

Get a copy of TweakNow RegCleaner Professional for FREE!

Last registry clean run: you have not run a registry clean yet.

● Quick Scan ○ Custom

● Beginner ○ Expert

TweakNow RegCleaner
Free ($26.95 Professional version)
TweakNow
www.tweaknow.com
● ● ◖
Windows 2000/XP/Vista

The app's user interface is simple. Just choose between Quick Scan or Custom Scan, along with Beginner or Expert mode, and then click a huge Clean Now button. The custom scan option lets you define what type of data to ignore in the Registry (such as fonts). The beginner and expert modes appear to work identically, although the beginner mode found 23 errors in the Windows 2000 virtual machine, while the expert mode found 30 errors in that same Win2000 virtual machine. (The beginner mode found 4 errors in the WinXP virtual machine, while the expert mode found 24 errors.)

After identifying potential problems, RegCleaner displays a list of potential errors identified as safe to delete, not fully safe to delete, or unknown. You can choose to delete all errors or just the ones identified as safe to delete.

RegCleaner automatically creates a backup of the Registry before the program modifies it. In case you delete a value that messes up your computer, the app can restore the backup version of the Registry at the click of a button.

TweakNow RegCleaner will appeal to anyone who wants a simple (and free) solution. For occasional use, RegCleaner will work, but you'd probably be better off buying the commercial version of this program or one of the other Registry optimizers in this review instead.

No matter what version of Windows you run or how new your computer may be, you will need a Registry optimizing program, either now or in the near future. Just as firewalls, disk defragmenters, and antispyware programs are no longer luxuries but necessities, so are Registry optimizers crucial for any computer. Once you use a Registry optimizer on a regular basis, your computer should run as smoothly as possible. ▲

by Wallace Wang

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◖ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT

Honest Technology Fireman CD/DVD Burner 3.0

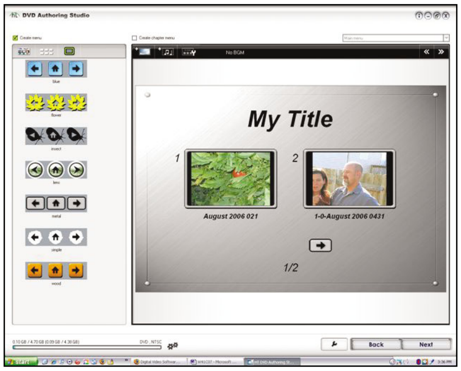
Many characteristics we liked/disliked about Fireman CD/DVD Burner 2.0 (July 2006 *CPU*, page 78) carry over to 3.0. Positively, the interface remains clean and well-organized, making it easy to dive into any burning, backup, DVD authoring, or other task. Conversely, Fireman still makes you hunt too hard for such information as which formats a specific tool supports, and the Help menu remains too vague. Further, although burn speeds were impressively quick, random crashes I experienced during seemingly straightforward operations were frustrating.

Fireman presents Data, Audio, Video, Backup, Utilities, and Help icons to start your projects. Each category contains multiple tools. Audio, for example, offers Audio CD, MP3 CD/DVD, WMA CD/DVD, Audio And Data CD, and Import Audio From CD options. Data and Video categories are similar in approach, while Utilities includes Erase CD/DVD, Make Label Or Cover, Photo Viewer, DVD Player, and ISO image creation options. However, on one system, Fireman reported I couldn't run DVD Player without a sound card installed, which the system had. The utility ran fine on another system using integrated sound.

New in 3.0 is support for LightScribe; capturing video from a camcorder, TV card, or USB devices; photo slideshows; creating WMA CD/DVDs; creating and restoring backups; and DVD Authoring Studio 2.0. Creating CD/DVDs is dead simple thanks to drag-and-drop functionality, but I had to work around several crashes before burning 53MB worth of WMAs to a DVD+R in about a minute. Attempts to back up a 75GB Western Digital drive also crashed several times ("Failed To Create Backup" was the only explanation given). Less problematic was creating VCD, SCVD, and DVD discs from MPEG video. DVD-creation options include a basic trimmer, transitions, effects, and adding audio and text.

Overall, Fireman CD/DVD 3.0's $19.99 price is alluring, and a patch adds Vista compatibility. A free trial is available to test the program's reliability on your systems before buying. ▲

by Blaine Flamig



Fireman CD/DVD Burner 3.0
$19.99
Honest Technology
www.honestech.com
●●●

Paragon Software Group Drive Backup 8.51

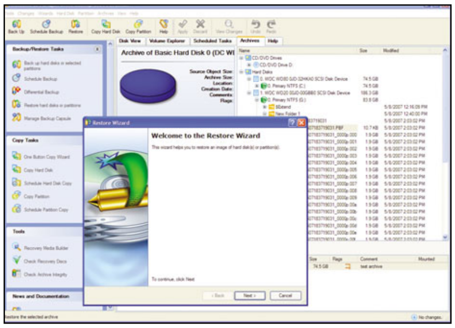
When last we left Drive Backup (November 2006 *CPU*, page 76), it had received a major interface overhaul that put the app's myriad wizards; tools; and copy-, restore-, and archive-related visuals in a Windows Explorer-like setting. This version adds Vista compatibility; an Incremental Copy tool to work with only altered sectors; an archive database for managing images; and ability to mount archives on separate partitions and access data, shut your system down after scheduled tasks complete, boot from a Backup Capsule without recovery media, and more.

Drive Backup's main work area still feels congested with its scores of menus, icons, tabs, and task pane. Most archiving, scheduling, and copying functions are wizard-driven, but, confusingly, you still must click a separate Apply button before a given task executes, despite wizards walking you through clicking Finish. Advanced options include encrypting archives with password protection, splitting images, processing sectors one by one, skipping OS auxiliary files during copying, and enabling/disabling hot processing. Paragon throws in basic partitioning tools and the ability to build bootable recovery discs, run integrity checks on archives and recovery media, and burn archives to dual-layer DVD±R discs.

DB archived an entire 75GB Western Digital drive to a 42.2GB image on a separate 200GB WD drive in a somewhat disappointing 36:24 (minutes:seconds) at the app's Fastest default compression. Normal compression took 41:55 for a 36.4GB archive, and Best compression took 1:21:12 to create a 33.2GB archive. Attempts to restore a 53.1GB archive hung before completing on the third try. However, archiving to DVDs (Blu-ray and HD DVD support is missing) and flash drives was wizard-easy, though some of Drive Backup's instructions read somewhat cryptically.

Drive Backup comes in Pro and three server editions. Personal Edition does offer limited dynamic disk abilities but lacks the email notification, scripting support, and several wizards other versions include. Although it's hard to imagine Drive Backup offers something your current backup manager lacks, the app is a good entry- or mid-level option. ▲

by Blaine Flamig



Drive Backup Personal Edition 8.51
$42.46
Paragon
www.drive-backup.com
●●●◖

live.pirillo.com

I still own the first Web cam I ever purchased. The 3Com HomeConnect is now safely collecting dust inside my USB drawer. (Yes, I actually have a drawer in my closet dedicated to storing all the classic peripherals I can't bring myself to trash.) Even by today's Web cam standards, the HomeConnect is still an amazing little device, which isn't saying much about today's standard Web cams. We've seen Web cam manufacturers adopt USB 2.0, boasting higher frame rates and increased image resolution, but little else in terms of innovation in recent years.

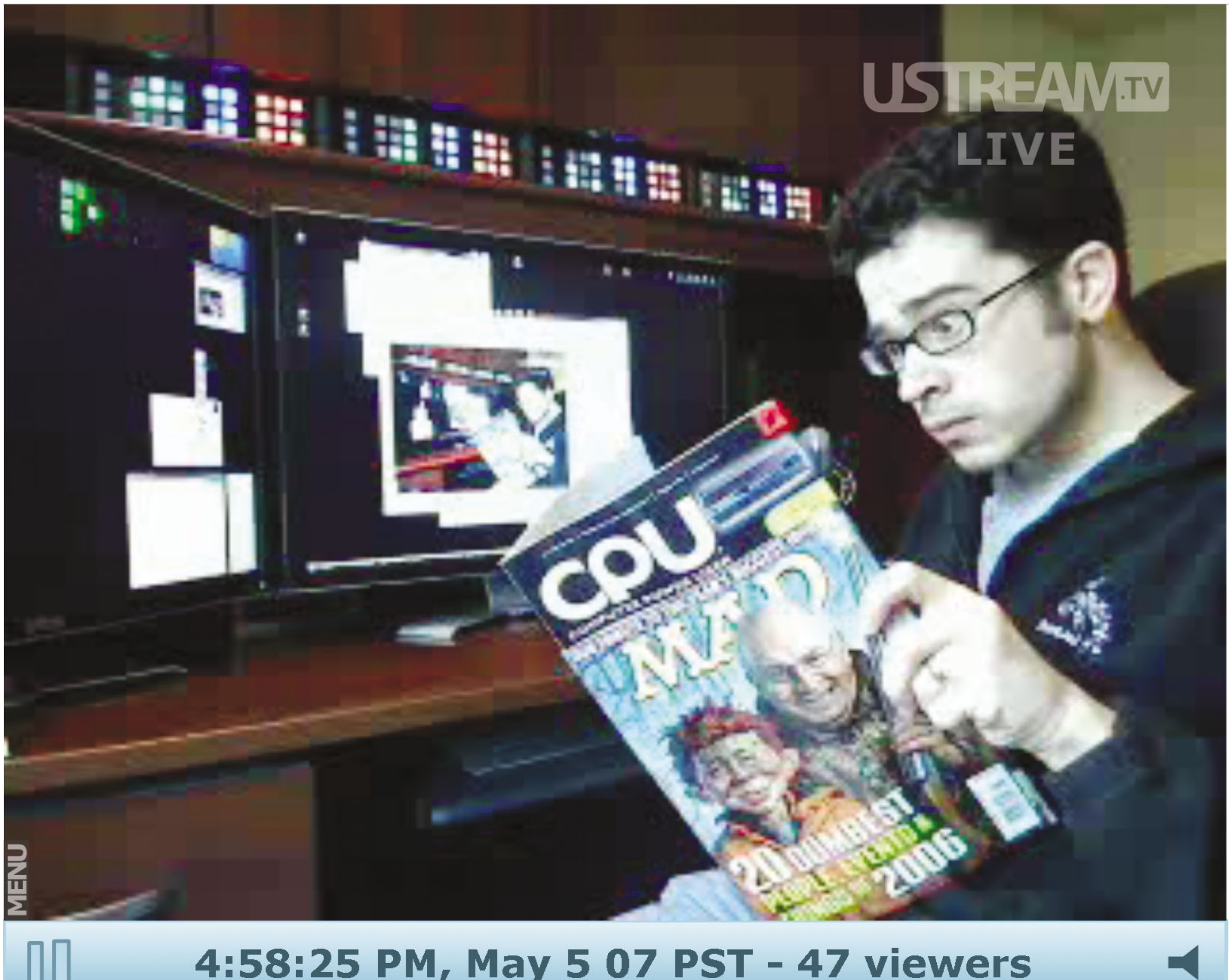
I upgraded from the HomeConnect to an Intel PC Camera Pro largely because it included a composite video input on its rump, which allowed me to connect just about any video source to my computer and capture an untold amount of content at 640 x 480. The video quality wasn't spectacular, but I was willing to make that trade-off for extended functionality. That was back in 2001, when we didn't demand too much from our video devices.

Apple upped the ante with its iSight, going as far as to integrate it into both its computers and operating system. Microsoft is just getting around to offering Web cams, which generally indicates that it's hoping to raise the bar for all "Web" cameras. Sadly, I still am unable to get my "Certified for Windows Vista" Microsoft LifeCam NX-6000 to work inside Windows Vista. Maybe I should wait for Vista Ultimate Service Pro Pack Plus Premium Platinum 3.

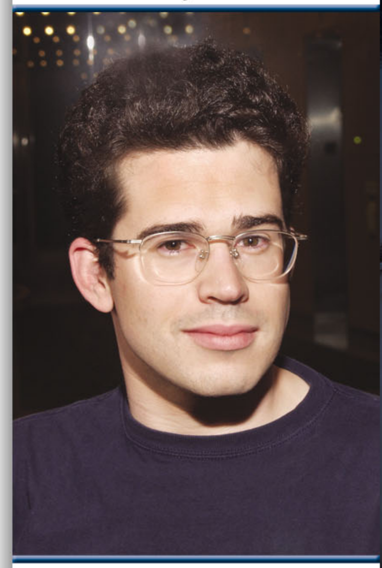
We're now living in the age of YouTube, with a renewed interest in Web cams and the software that further enables the video lifestyle. The upload options from laptops, desktops, and mobile devices are plenty, as are production software apps. We're recording every possible random moment of our lives to share with relatives, friends, and strangers from across the world. It's never been easier to do.

But what comes next?

Recently, I was introduced to a new service that changed the rules for Internet video without the world knowing. No, it's not the ballyhooed Joost, and it's not YouTube 2.0.



by Chris Pirillo



It's Ustream.tv, and it's going to revolutionize the way you communicate with your peers. In fact, that description was written by someone who was watching me compose this article through my Ustream video stream. (Thank you, LordKaT.)

I'm at live.pirillo.com, but if I'm not live, a member of my community is. Don't just send me email feedback this month. Swing by and say hello.

I've seen services like Stickam.com before, but Ustream.tv is different in the sense that it enables users to embed a live video feed as easily as they can embed a "dead" YouTube video on any Web page. More to the point, you can now start streaming live video (anywhere) for free.

The service has not been without its fair share of hiccups. Not long after I introduced Ustream to my small community, a few more popular friends latched onto it with both hands (Cali Lewis from GeekBrief.tv, Robert Scoble from Podtech.net, and Leo Laporte from TWiT). From there, adoption spread like wildfire, and Ustream struggled to keep up with demand.

Johnny Hartman offered live video from the Podcast Hotel conference in San Francisco, while on the other side of the country, iJustine was streaming PodCamp live from Pennsylvania. It's not that live streaming video wasn't available before now; it just wasn't as readily accessible, affordable, transportable, and discoverable.

This is far more interesting to me than television will ever be. I can list dozens of experiences I've already shared in the few short weeks I've been wrapped up in streaming a certain part of my life live online. This is less like Justin.tv (check it out if you haven't already) and more like . . . well, it's un-like anything else I've ever experienced. It's audio in sync with video in sync with IRC chat in sync with other streams—all happening live.

Minutes after a recent earthquake in Acapulco, we connected with at least two Mexico City bloggers who blogged about the event as it unfolded. Our live stream had already been active for a few hours at that point, so the audience was already assembled and ready to go. The discussion was loose but still relatively important in the sense that we were delivering experiences much quicker than traditional media could (or would, for that matter).

Kevin Cupp, a student from Virginia Tech, was able to phone in and discuss his perspective on the tragic day's events with our live audience, hours before appearing on CBS Evening News (using Ustream to connect with CBS' producers, might I add). Again, we were able to beat traditional media to the punch. We cut through the clutter and sensationalism with a raw, direct feed. Our chat room was asking plenty of questions without any kind of filter.

Producing static content is no longer interesting to me. Without some kind of "live to tape" component to it, I'm limited to my own devices (literally and figuratively). Soon enough, there will be dozens of free live video streaming services on the landscape. Ustream.tv was just the first to truly capture my attention without touching my wallet.

So let me ask my live chat room now (we're living at irc.wyldryde.org in #Chris if you ever care to join us): Why are you drawn into what Ustream has offered us? What keeps you coming back every day? Is this just a fad?

[14:28] <+cranberyxl> Blogging brought one level of interactivity with an author (producer); Ustream takes it to the next level.

[14:28] <@LordKaT> Ustream offers us a way to defeat the scaling problems faced by so many of us in the past when we provided early Web cam feeds to our friends on IRC. ;)

[14:28] <+UDP> What keeps me coming back to [Chris's Ustream feed] is the community.

[14:28] <+Phantompyro> Always something interesting to talk about.

[14:29] <+MoeLassus> Chris, the opportunity for live interaction with "streamers" is captivating. Live interactive interviews with industry players are also something that interests me.

[14:31] <+Pirillotron950> You gain a feeling of involvement and being listened to.

[14:34] <+Pirillotron050> With Ustream.tv, the experience of the viewer depends on how well the person on-camera communicates with the audience.

We've now taken column writing to a completely different level. You're welcome to join me (read: us) anytime. ▲

Bio blurb: Chris Pirillo (chris.pirillo.com) decided to let his chat room compose his byline. Here's how they chose to describe him: Chris is the awesome winnar of the internets ++ / Chris is made of coffee and sushi / Chris, Internet entrepreneur, technophile, and bare-chested PR <censored> / Chris has the schedule and bandwidth to jump start this kind of phenomenon / Chris will do anything for $25 / Chris has a really cool orange hat / Chris has a cute dog / Shoe on head / Chris loves peanut butter and jelly / Chris amuses me greatly.

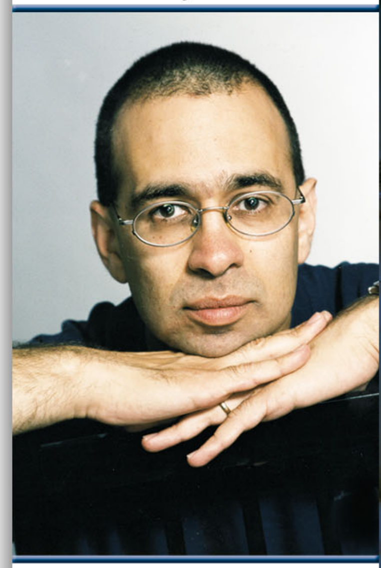
This is less like Justin.tv and more like . . . well, it's unlike anything else I've ever experienced. It's audio in sync with video in sync with IRC chat in sync with other streams—all happening live.

You can dialogue with Chris at chris@cpumag.com.

Open Sauce

Top Four Reasons Linux Rules

by Pete Loshin



Pete Loshin, former technical editor of software reviews for Byte Magazine *(print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.*

Not long ago, while leading my lavish *CPU* columnist lifestyle (up at noon, surfing the 'Net for a few hours before getting ready to party), I read "Things I can do in Linux that I can't do on Windows" on Dan Martin's blog, (dmartin.org/weblog/things-i-can-do-in-linux-that-i-cant-do-on-windows), as well as Prakash Advani's list of "101 reasons why Linux is better than Windows" (cityblogger.com/archives/2007/01/24/101-reasons-why-linux-is-better-than-windows), even if he lists only 36 reasons so far.

I've written before about things you can't do with Windows but can with Linux, but it's been a while. And the fact that I haven't done *anything* with Windows for the past seven years or so means that there's a whole universe of things *I* can't do with Windows because *I* can't do *anything* with Windows.

If I were *really* lazy (as opposed to just regular-lazy) I'd rehash items from Prakash and Dan's lists for this month's column and go back to watching unreleased "Ren and Stimpy" episodes on my 102-inch plasma TV. But because I'm truly conscientious, I'll add value for loyal *CPU* readers with my own list of what Linux gives me: resilience, manageability, usability, and no/low-cost solutions.

Dan and Prakash go into the specifics and give some good examples of applications that you can't get on Windows. For example, Dan, a Web developer, likes having the ability to run different versions of Internet Explorer simultaneously using the IEs4Linux project (www.tatanka.com.br/ies4linux). But for me, it all boils down to these four things:

Resilience. I include here the now-meaningless market-speak "robustness," as well as reliability and security. Most software works fine on systems with lots of resources and perfectly formed data. In the real world I need an OS that gracefully handles too many processes running on a system with an old CPU and insufficient RAM. Remote system-pwning Linux exploits are rare; email viruses are unheard of; and crashed apps don't require a reboot.

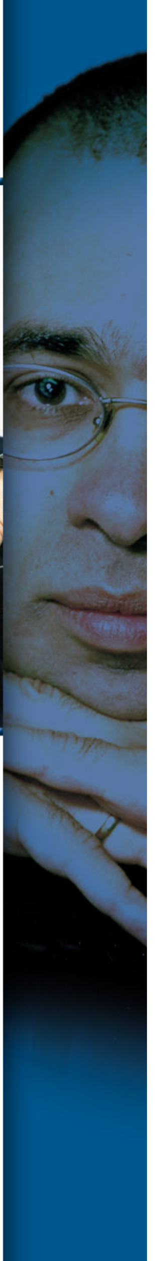
Manageability. Can I easily back out of software upgrades, automate patch installations, change configurations without rebooting, administer the system free of activation codes, and back up personal configurations and data? I get all that with Linux. Can I run a supported version of Linux on otherwise obsolete hardware or modern computer platforms from palmtop to mainframe? Yup. Can I examine and modify the source code? Yes. Do I worry about vendor lock-in, or being stuck with proprietary products orphaned by bankruptcy or other corporate hijinks? Not at all.

Usability. I needn't relearn everything every time some vendor decides it's time to "upgrade" the UI. Will DOS batch files still work? What about app-specific scripting languages, which changed to VBScript (and then changed again)? Configurability falls under this heading, too: I can configure the way almost everything works with KDE, GNOME, or one of dozens of other desktop managers. Did I mention portability? Not just across platforms, but across time and space. I can carry system settings/desktop configuration/key data on a USB thumb drive and boot into my desktop from any PC. And I don't need to relearn (or reconfigure) all my applications and utilities when I update system software, nor do I need to update scripts or applications every time I upgrade my OS.

No/low-cost. Microsoft's deal last year with Novell signaled Linux is a legitimate OS, so why use the high-priced spread? You don't really pay much extra for Windows when they buy a new PC (the already low-cost license is subsidized by shovelware publishers who pay to be included in the standard OS preinstall). Microsoft's real cash flow comes from corporate sales; same is true for Linux vendors like Red Hat and Novell. Key developers of Linux components receive funding from companies like IBM that are increasingly relying on open source. Personally, most of the "cost" I've recovered has been in the form of reducing the amount of time I spend fiddling around with computers running Linux.

Sure, applications exist that aren't available (yet) on Linux (for example, tax prep); and yes, there are times when proprietary software works better than open source. But for me, the benefits of open source simply overpower any disadvantages I've encountered. ▲

In the real world I need an OS that gracefully handles too many processes running on a system with an old CPU and insufficient RAM.



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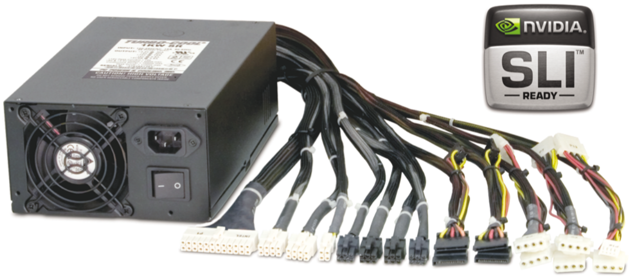

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Clogged Pipes

Are We Running Out Of Bandwidth?

Have you ever noticed that your downloads seem just a bit slower in the mid and late afternoons? Does it feel as if navigating the Web is noticeably faster at 2 a.m. during one of those all-nighters? If so, then you might be experiencing the first local signs that bandwidth capacity is not keeping up with demand, says major tech analyst Deloitte Consulting.

"You can probably experience problems now depending on when you use the Internet," Deloitte analyst Ed Moran told InternetNews. When the kids come home from school in late afternoon, a great video and audio downloading frenzy begins, and the infrastructure is starting to feel the strain. Much of the clogs probably occur closest to home, where ISPs have to handle head-end traffic block-to-block. "Your neighborhood takes a hit in performance, and it's not hard to extrapolate that out to a wider impact," says Moran.

Tales and prophesies of the Internet reaching its capacity have dogged this medium for years. One of the originators of the Internet, Bob Metcalf, famously predicted in a 1995 column that the fast-growing network would collapse in the next year or he would *eat his words*. As we are all here to attest, the Internet kept running smoothly, and Metcalf made good on his promise by actually eating the misguided column on stage in 1997 during a keynote address. No one is promising such entertaining spectacles in this round of the bandwidth debate, perhaps because the stakes are a lot higher now, involving public policy and whether ISPs, consumers, or dotcoms will underwrite the next big build out of network capacity.

In a controversial prediction earlier this year, Deloitte analyst Igal Brightman argued the firm's perspective that "one of the key possibilities for 2007 is that the Internet could be approaching its capacity. Bottlenecks are likely to become apparent in some of the Internet's backbones, the terabit-capable pipes exchanging traffic between continents. Investment, either in laying new cable or lighting existing fiber, may be stifled by continuing falls in wholesale capacity prices." This strain on the infrastructure and lag between demand and supply may reach the consumer. Brightman goes on to warn that "the impact may be most noticeable in the form of falling quality of service. Surfers are most likely to be annoyed by the slowdown in service." Just one more uptick in the rate at which users suck down YouTube and consumers may start complaining, Deloitte predicts.

YouTube is no joke. The staggering increases in bandwidth use in recent years are most often focused on our insatiable hunger for video, far and away the fattest data we use. Not only are clips of piano-playing cats traversing the Internet at light speed, but the peer-to-peer downloading of massive film files accounted for up to 71% of all Internet traffic by January of 2006, according to CacheLogic. And now, equally large bandwidth hogs are coming online as IPTV (that is, Verizon FIOS) uses the backbone to transport HDTV and Internet-based TV services such as CBS' In-nerTube and JoostTV pour primetime programming online.

But more than just video, we are seeing a profusion of new devices linking to the Web, and this may further strain Internet systems. "The demand for multiple connections, anywhere, anytime and from any device, is exploding," Nortel CEO Mike Zafirovski told his shareholders early this year. "It is a phenomenon being driven by the proliferation of handheld devices and the convergence of wired, wireless, and IP. Cameras, MP3 players, security systems, appliances, and much more." For companies such as Nortel, which supply technology for the infrastructure, this is only good news. But for the addressing system that directs traffic around the Web, the profusion of entry points to the Internet may cause an IP address shortage. The current TCP/IP protocol is a 32-bit system that can accommodate 4.3 billion unique addresses. But according to analysts Frost & Sullivan, Q&A

Nortel's John Beatty On A Hyperconnected World

Nortel, which supplies both technology and strategies to large ISPs, only sees bandwidth demand escalating, says senior product marketing manager for Metro Ethernet Networks, John Beatty. National ISPs are starting to see their central infrastructure (or their "core") reach capacity or starting to see problems at the "metro" or regional hubs in their systems or the "access" level, the localities where individual users connect to the network. The company has been warning its own customers that all the links in the provider's network chain are about to be pounded even more by billions of new remote devices that will be coming online in the next few years.

CPU: Do you agree that increased use of multimedia online in recent years is straining bandwidth?

Beatty: I agree. There are tangible user applications, sites like YouTube, where 100 million videos are watched every day and 60,000 new clips are added every day. The average time users spend on the Internet is increasing up to as much as 43 minutes a day.

CPU: Some in the field argue that the overall capacity of the Internet is not really under strain.

Beatty: It is hard to answer that question and say the Internet is something where the capacity is being strained, because the Internet is a collection of networks that various different service providers peer together. Different providers are experiencing different bandwidth constraints in different parts of their networks. I do believe that most providers are seeing the utilization in their cores filling up. That is a result of increased traffic in their metro and access regions.

CPU: Where are the biggest choke points now in an ISP's network?

Beatty: I would say the metro and access regions. The problem is how they deploy their applications. ISPs may have Internet servers at various points across their metro and banks of servers serving regions in a metro. How close do you put those video servers to potentially deliver IP video or IPTV traffic or video on-demand? It is tempting to place them close to the users for performance reasons, yet that is more expensive.

CPU: How does the emergence of new devices such as products that support mobile Internet access add to the load?

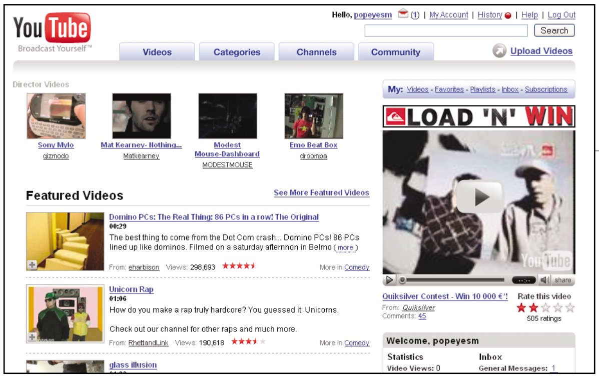
Beatty: A ton. Our CTO has been talking about "hyperconnectivity." People have multiple connections to the Internet and what we call "personal pervasive broadband," which is that one user wants various types of content over various devices. There are an increasing number of devices, particularly mobile, and the cell phones use more and more video every day. Today 60% of all Internet traffic is video-based.

we will run out of new addresses in five to seven years because so many of these new devices require unique IP addresses. When IP allotments were assigned to nations at the inception of the Internet decades ago, countries such as China received a limited number. This is why regions like Asia are moving directly to the next generation of Internet protocol, the 128-bit IPv6, which can handle many times the number of currently available addresses.

Asia could well be a flash point for bandwidth slowdown. Asia Netcom CEO Bill Barney recently claimed that Web usage in his region increased 13,857% between 1998 and 2005. Running at a current capacity of 15,360Gbps, Asia would exceed its available bandwidth by 2012. "It's a wireless revolution in Asia, and it's a broadband revolution," Barney said in a company strategy briefing. "It's a problem for our industry, but it's a good problem to have."

Locating The Problem

Or is it a problem at all? Some analysts contend that the new alarmism over Internet capacity is wrong-headed. "The whole idea that the increase in traffic is going to break something or kill something, or that providers won't keep up, seems foolhardy to me," TeleGeography analyst Eric Schoonover recently told *CIOInsight* magazine. TeleGeography researches bandwidth and found global use of the Internet core was only at 34% of its overall capacity in 2006, with peak utilization at 47%. Still, the company's research admits that traffic growth is outpacing the expansion of the network. Traffic was up 75% last year while the network grew only 47%. The ISPs know when and how to keep ahead of the curve, and they have a considerable cushion for now, TeleGeography finds.



Domino PCs: The Real Thing: 86 PCs in a row! The Original
00:29
The best thing to come from the Dot Com crash... Domino PCs! 86 PCs lined up like dominos. Filmed on a saturday afternnon in Belmo (more)
From: eharbison Views: 298,693 ★★★★★ More in Comedy

Unicorn Rap
01:06
How do you make a rap truly hardcore? You guessed it: Unicorns.

Check out our channel for other raps and much more.
From: RhettandLink Views: 190,618 ★★★★☆ More in Comedy

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According to networking experts, video now accounts for up to 60% of all Internet traffic. YouTube streams over 100 million clips a day, some say.

Still In Neutral

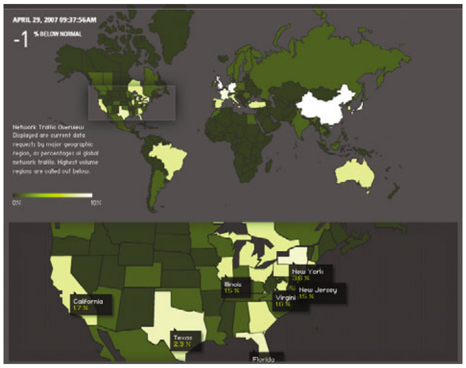
Federal legislators introduced no fewer than five network neutrality bills and amendments in 2006, all of which stalled under the press of elections and intense lobbying from the telecom industry. Chair of the Senate Commerce Committee Byron Dorgan, one co-sponsor of the push, promises to bring pro-neutrality legislation to the Senate floor, and Washington analysts predict some action this year. Meanwhile, the Federal Communications Commission weighed in obliquely on the issue by approving a merger of AT&T and BellSouth if the two companies agreed to strict network neutrality for two years. The FCC now says it is formally studying the issue.

U.S. Online Video Viewers (millions)

2003	52.3
2004	69.6
2005	89.4
2006	107.7
2007	123.4
2008	137.2
2009	149.0
2010	157.0

Source: eMarketer

But the real problem may be more local than global. Even if overall Internet capacity remains sufficient, the choke points begin occurring closer to the "access level" where scores of users run torrents and draw down YouTube while using video chat. Users may start seeing the slowdown even when the Internet as a whole does not, because ISPs have to keep up with local demand. At Nortel, an ISP consultant and tech supplier (see the "Q&A" sidebar), the company created a new unit focused on the problem of helping ISPs keep on top of the bandwidth crunch. The answer is both in hardware and software, Beatty says. ISPs will need to figure out where best to place servers dedicated to content, such as video, on the network and optimize the connections so that traffic moves efficiently.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Network Traffic Overview
Displayed are current data requests by major geographic region, as percentages of global network traffic. Highest volume regions are called out below.
0%
10%
California 1.7 %
Illinois 1.5 %
New York 3.6 %
New Jersey 1.5 %
Virgini 1.0 %
Texas 2.3 %
Florida

Network services provider Akamai maintains a monitor of the share of server requests coming from specific regions of the world. New York alone accounts for 3.6% of those requests.

Hardly Neutral

Is the supposed bandwidth shortage a problem that ISPs would like us to think we have? Almost any argument about Internet capacity seems to track back to the larger issue of 'Net neutrality. As bandwidth use grows, ISPs have been pushing to pass on the costs of adding network capacity either to consumers or to the content providers such as Google and YouTube that originate the high-bandwidth content. It is in the ISPs' interest to depict a "bandwidth crisis." So far, the Internet has been "network neutral," in that service providers do not charge tiered rates based on the types of services users access over their connections even though some content types strain the network more than others. Also, under the currently "neutral" network, ISPs treat all packets of information coming through their networks equally regardless of the source. Some ISPs have proposed a tiered Internet system where publishers pay for preferential treatment on an ISP network and so bear more of the cost of expanding the necessary hardware. In order to stave off tiered charges to consumers or publishers, several legislators introduced various kinds of 'Net neutrality legislation last year that would prohibit ISPs from discriminating among Internet packet types. (See "Still In Neutral.")

The problem with understanding whether or not (or where) we risk running out of bandwidth is that everyone has some skin in this game. Google, which is one of the companies ISPs often target as an undeserved beneficiary of 'Net neutrality, opposes just about any plan to charge content providers and portals for the bandwidth their users take. CEO Eric Schmidt told an investor's meeting that Internet slowdown isn't a backbone problem but a "last-mile issue" involving how the ISPs manage and share traffic among households in people's neighborhoods. If the Internet needs further build-out, he suggested the U.S. government might get involved because the information superhighway is now integral to the economy. On the other hand, ISPs and their defenders argue that without additional money coming from consumers or publishers via some kind of non-neutral service, there won't be any economic incentive to invest in a bigger, better Internet.

This twisted pair of pipes, a bandwidth crisis and 'Net neutrality, will only get more confusing as 2007 goes on. According to Senator Dorgan, "The issue has moved from an unknown technology issue to one of the dominant telecom and Internet policy debates in DC."

by Steve Smith

Infinite Loop

The Mod Squad, 2007 Style

It's a good thing the late Tige Andrews isn't around to read about this, because Captain Greer would probably have a thing or two to say about the latest batch of crime fighting youth. Viacom has recruited the "YouTube Police," a band of twenty-somethings who manually comb YouTube in search of copyrighted Viacom content. As soon as Viacom sends YouTube a cease-and-desist notice, YouTube sends its own team of youngsters to take down the content at issue.

Source: http://www.businessweek.com/magazine/content/07_21/b4035060.htm?chan=technology_technology+index+page_best+of+the+magazine

The Department Of Stuff

by Rob “CmdrTaco” Malda

ads.txt

There’s a race underway, and it doesn’t bode well for anyone. The race is being run on a number of tracks: print, the Web, TV, and radio. Anywhere advertising is used to subsidize the cost of publication, you see this race. Junkbusters vs. Web sites. Tivo vs. the TV networks. And, of course, people simply changing their radio station when the Non Stop Music Block ends and is replaced by several minutes of people screaming at you to buy a number of items you’re simply not in the market for. Advertising vs. content.

The Internet is where this problem started appearing. In the early 1990s, online advertising was rare. Although the major commercial sites might have a simple ad or two, it really wasn’t particularly intrusive. Of course, back then these ads were worth a lot of money: Readers would click through a high percent of these ads, and clients were willing to pay many dollars to show those ads to a thousand people.

But over time, human instincts such as sloth and greed kick in, and the inevitable follows. The original standard size and shape for banner ads was very small and unobtrusive. Of course, people get desensitized to advertising in a familiar format. After a few years the solution was clear: Make the ads larger, of course!

But that wasn’t enough. Content creators wanted to feed their bottom line. Over the course of the following years, pages started featuring more ads. Larger ads. And, naturally, as technologies such as Java and later Flash made more elaborate productions possible, the ads transformed from images to animated GIFs to interactive video games with sound and music.

Now some of these things are simply inevitable. As users become increasingly bombarded with advertising, they demonstrate a remarkable ability to simply tune out noise. This results in descending click-through rates, which of course marketing folks take as a cue to make ads bigger, loud er, and more intrusive.

As marketers grow more bothersome, developers strike back. A decade ago the concept of a junkbuster was almost silly. Why would you bother with such a thing? But with each passing “improvement” in Internet advertising, the motivation to install a junkbuster grows. By the time Firefox came onto the scene, the concept of the pop-up blocker was built into the browser. Users knew from the start that some ads were unacceptable. And just a couple clicks make your filters much more powerful.

These days advertisers’ tactics are less savory: Partnerships where the lines between commercial content and journalism grow increasingly blurry. Is that product review you’re reading an unbiased summary or part of an ad campaign paid for by an advertiser? Sometimes it’s hard to tell.

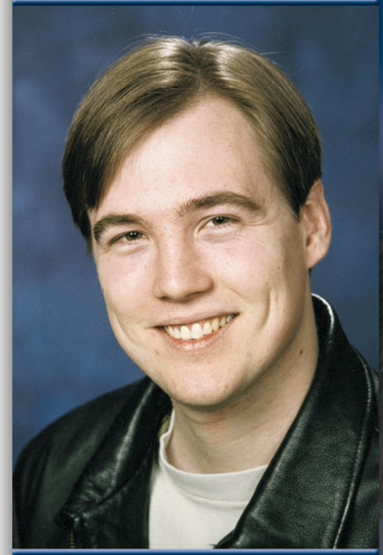
These same problems play themselves out in every medium. TiVo made it possible for you to fly past television ads, which has only resulted in more product placement within your favorite program. Radio programs, desperate to get people to stay on their channel, have been experimenting with DJs telling you about products instead of running the standard 30-second spot.

There are two really tragic results from all this: The first is that the content publishers are attempting to use both technology and the law to prevent people from getting around their advertising. Sometimes this isn’t such a big deal, but laws such as the DMCA are serious attacks on basic rights like fair use and reverse engineering.

The second and equally tragic result is the breakdown of the line between paid advertising and independent content. It’s one thing when James Bond drives a BMW in his latest film, but it’s something else when you don’t know the biases of a news report.

Finally the upside: The Internet makes it possible for the independent content creator to get on the map. The low overhead for an individual content creator can (for now) let that content creator take on the big media creators in many industries. From comics to news to commentary, all of this makes the economy of scale far less advantageous, which only aids diversity of information online. ▲

by Rob “CmdrTaco” Malda



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the ’Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

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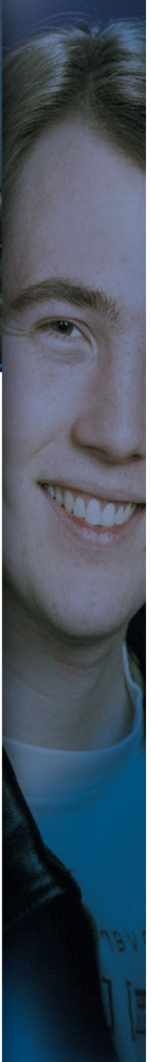


ROAD Warrior

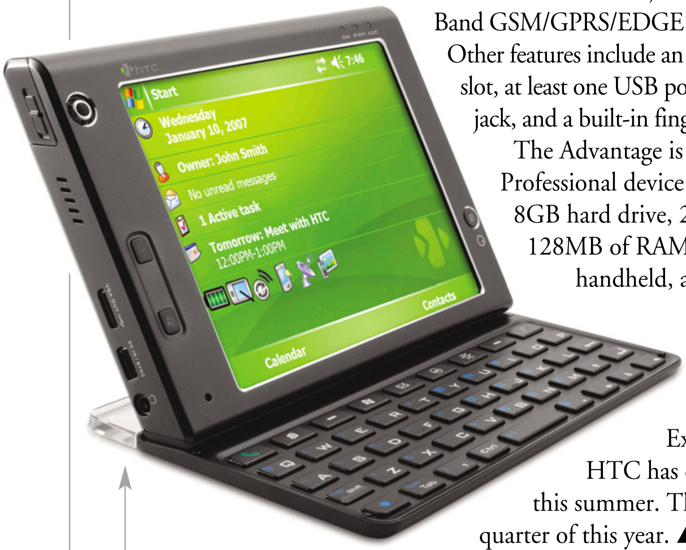
by Jen Edwards

HTC Announces Shift, Advantage Mobile Computers

HTC unveiled two new ultra-portable computers at the CTIA Wireless conference in March. The Shift includes Windows Vista Business, a 7-inch, touch-enabled widescreen display, and an integrated QWERTY keyboard in a package similar in size to a couple of DVD cases. It comes with a 30GB hard drive and strong networking options, with built-in Wi-Fi, Bluetooth 2.0, tri-band UMTS/HSDPA (Universal Mobile Telecommunications System/High-Speed Downlink Packet Access) and Quad-Band GSM/GPRS/EDGE data. Other features include an SD card slot, at least one USB port, a headphone jack, and a built-in fingerprint reader.

The Advantage is a Windows Mobile 6 Professional device with a 5-inch VGA touchscreen display, 8GB hard drive, 256MB ROM (for program storage), and 128MB of RAM. A QWERTY keyboard (included) magnetically connects to the handheld, and GPS navigation is also included. A miniSD slot provides additional storage, and a headphone jack lets you listen to your favorite tunes instead of the airport PA. Outlook Mobile and Office Mobile are preloaded, enabling you to manage your calendar, contacts, and tasks, as well as view and edit Word and Excel files.

Exact pricing and availability have not yet been announced, though HTC has confirmed that the Advantage will be available to U.S. consumers this summer. The Shift will be available in the United States and Europe in the third quarter of this year. ▲



The HTC Advantage bridges the gap between a typical Pocket PC and a UMPC, with a large touchscreen display and detachable keyboard.

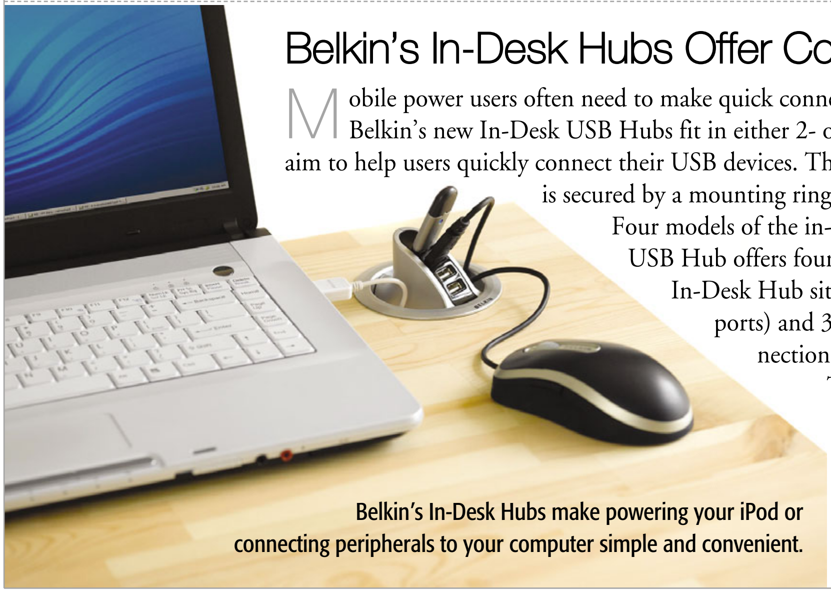
The Shift balances portability and power, offering the major features of a laptop without the bulk.

Belkin's In-Desk Hubs Offer Convenient Connections

Mobile power users often need to make quick connections, whether in an airport or at the home office. Belkin's new In-Desk USB Hubs fit in either 2- or 3-inch grommet holes found in most desks and aim to help users quickly connect their USB devices. The cable clutter-reducing hub sits inside the hole and is secured by a mounting ring.

Four models of the in-desk hub are available. The Front-Access In-Desk USB Hub offers four raised, angled ports for easy access. The standard In-Desk Hub sits flush with the desk and comes in 2-inch (three ports) and 3-inch (four ports) versions, each with an LED connection status light.

The In-Desk Dock for iPod is compatible with 4G and 5G iPods, 1G and 2G nanos, and iPod mini. Your iPod charges and syncs while it's connected to the dock, and a stereo-out jack connects to speakers or headphones. All of the In-Desk USB Hubs are available for $39.99. ▲



Belkin's In-Desk Hubs make powering your iPod or connecting peripherals to your computer simple and convenient.

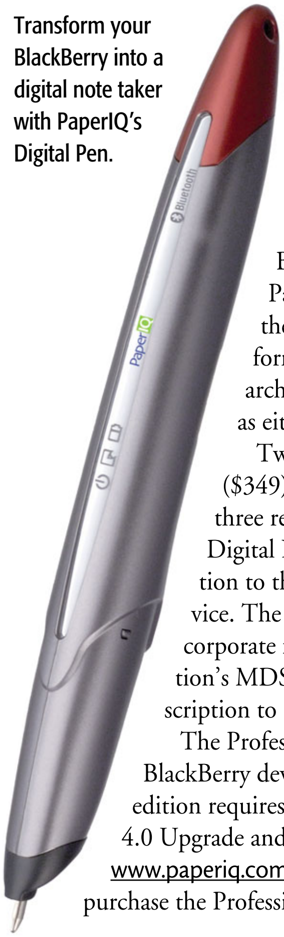
Sansa Wirelessly Connects To A World Of Music

SanDisk's latest portable music player, the Sansa Connect, has a 2.2-inch color screen, 4GB of storage, a miniSD slot for memory expansion, support for MP3 and WMA playback, and an internal speaker that lets you share your music. What sets it apart from other players is the built-in Wi-Fi that lets anyone with a Yahoo! Music Unlimited subscription listen to Yahoo! LAUNCHcast Internet radio and view Flickr photo albums for free. You can also see what your Yahoo! Messenger friends or nearby Sansa Connect owners are listening to.

The Sansa Connect is also compatible with Yahoo! Music Unlimited To Go, letting you download over two million songs to the player without a PC, including the tracks that your Yahoo! Messenger friends have recommended. Other PlaysForSure music subscription services are also supported, but only with a PC connection. The Sansa Connect is available now for $249.99. ▲

The Sansa Connect adds Wi-Fi to the typical features of a portable music player.

PaperIQ Brings Handwritten Notes To Your BlackBerry



Transform your BlackBerry into a digital note taker with PaperIQ's Digital Pen.

Digital Pen for BlackBerry lets you take handwritten notes (including images and charts) and send the information to your BlackBerry handheld as a contact, task, or memo. The PaperIQ handwriting recognition application on the handheld translates your notes into digital form. The information is also sent to an online archive in the original format and can be downloaded as either a Microsoft Word document or PDF.

Two versions are available; the Professional version ($349) includes the PaperIQ DP-201 digital pen with three refills, USB travel and desk cradles, Easybook Digital Notebook, a users guide, and a one-year subscription to the PaperIQ handwriting recognition and fax service. The Enterprise edition adds the ability to use existing corporate forms in a digital format using Research In Motion's MDS Studio with either PaperIQ Server or via subscription to PaperIQ On Demand.

The Professional version requires a Bluetooth-equipped BlackBerry device running OS 4.0.2 or higher. The Enterprise edition requires BlackBerry Enterprise Server 4.0 with the MDS 4.0 Upgrade and MDS Studio. More information is available at www.paperiq.com/blackberry_overview.mspx; U.S. customers can purchase the Professional version from BlackBerrySource.com. ▲

New Leaps In Laptop Drives

Gone are the days that consumers had the relatively simple task of choosing the amount of hard drive storage they wanted in their new laptop computer. These days you also have to decide whether you're willing to pay for a new SSD (solid-state disk) drive. These drives offer faster boot times, superior read/write performance, and significantly better battery life. On the other hand, cheaper traditional spinning drives offer larger capacities with noise reduction and battery life enhancements.

Dell is now offering a 1.8-inch, 32GB SSD from SanDisk in its Latitude D420 ultra-mobile and D620 ATG semi-rugged laptops. The flash-based drive offers far superior durability to traditional drives, and during impact testing, Dell's engineers found that the notebook computer would break before the drive, ensuring that important data is always safe. The new $549 SSD option also provides a 34% faster boot time and 23% better overall system performance. SSDs are also starting to appear in UMPCs, with Samsung's Q1P offering a 32GB SSD that reads data 300 times faster and writes 150 times faster than a traditional spinning hard drive.

If you need more room than the SSDs currently available but still want some of the performance benefits, consider Samsung's latest 2.5-inch hard drives, the SpinPoint M5 and MP1. The consumer-oriented M5 ranges in capacity from 60 to 160GB, with a dual-disk 250GB model currently in development. Samsung says that the M5 drives are 15% quieter and consume approximately 5% less power than other drives of the same capacity. The 5,400rpm single-disk versions have already started mass production and should be available soon.

The enterprise-oriented MP1 will be available in capacities from 80 to 200GB, running at 7,200rpm. Although they're designed for enterprise workstations and servers, some manufacturers may choose to put these premium 2.5-inch drives into notebook computers, as well. ▲

At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

Audio Video Corner

by Blaine A. Flamig

$18.98
Kill Rock Stars
www.sweetadeline.net

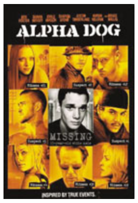
Elliott Smith—"New Moon"

When success came knocking on Elliott Smith's door in 1997 by way of an Academy Award nomination for his "Miss Misery" track from "Good Will Hunting," it seemed only a matter of time before a wider audience would sink into Smith's folk-punk brilliance. Before his death (the cause still remains undetermined) in 2003, Smith was an ultra-gifted songwriter known for surrounding his memorable hooks with raw, melancholy lyrics. This two-disc set of 24 songs, which Smith's longtime producer Larry Crane touchingly crafted after his death, carries on that legacy. Acoustic, bare-boned, and gracefully beautiful, "New Moon's" songs often sound like unfinished demos, yet they float cloud-like with a lilting ambience that reminds us how sorely missed Smith is.

$12.99
Fat Possum Records
dinosaurjr.com

Dinosaur Jr. "Beyond"

Oh, how we've missed those 1980s alternative darlings Dinosaur Jr. Nothing screams rock and roll like waves of guitar feedback rifling through amps turned up entirely too loud, and few other indie guitarists have ever matched noted slacker J Mascis' propensity for creating such noise or fuzzing out simplistic, yet catchy, melodies with riff-blazing glory. With the fantastically talented Lou Barlow back in his rightful place on bass and original drummer Murph behind the kit, Dinosaur Jr. follows up its unexpected 2005 reunion tour with the jaw-droppingly excellent "Beyond," 11 terrific rock songs searing hot with Mascis' crunch-filled lead blasts and more variety than Dino fans could have wished for.



$29.98
Universal Studios
www.alphadogmovie.com

Alpha Dog

Possibly the best aspect of the mostly-entertaining-but-flawed "Alpha Dog" is the unexpected, convincing performance boy-band-member-turned-actor Justin Timberlake turns in as reluctant kidnapper Frankie. Frankie is friend/stooge to Johnny Truelove (Emile Hirsch; "Lords of Dogtown"), a young but major California drug dealer who kidnaps, Zack, stepbrother of Jake (an excellent Ben Foster), who owes Truelove more money than he can repay. Based partially on the life of actual drug dealer Jesse James Hollywood, director Nick Cassavetes supplies ample intensity but can't make us care about the characters' plight, including the incredibly naïve Zack.

$24.98
BBC Warner
www.bbc.co.uk/comedy/littlebritain

Little Britain Live

Think Monty Python's Flying Circus sketch comedy with a modern British twist and you have an idea of what "Little Britain" is about. The award-winning BBC series starring Matt Lucas and David Williams is full of memorable characters, shock-and-awe deliveries, and satire so sharp it could cut meat. In 2006, the duo adapted "Little Britain" for the road, playing to sold-out crowds across England. Shot in the Blackpool Opera House, "Little Britain Live" translates so well live (Lucas and Williams interact with the crowd brilliantly), we can only hope for subsequent tours. The wonderfully packaged DVD includes deleted scenes and a making-of segment.

See the full reviews from A/V Corner at www.cpumag.com/cpujol07/AYL

DVD Byte

5/29

Hannibal Rising
Curse Of The Golden Flower
Weeds: Season 1

6/5

The Best Of Chappelle's Show
The Messengers
Norbit

6/12

Breach
Ghost Rider
Welcome Back Kotter: The Complete First Season

6/19

Bridge To Terabithia
Miss Potter
Reno 911!: Miami

IL-2 STURMOVIK 1946

The All-In-One Collector's Edition *-by Dr. Malaprop*

$29.99 (PC-DVD) • ESRB: (T)een • Ubisoft • www.il2sturmovik.com

We've had coverage of various bits and bobs of IL-2 Sturmovik since its release in late 2001. For those unfamiliar with the game, IL-2 is an in-depth PC flight simulator set during World War II with a Russian vs. German point of view. IL-2 is notable for its numerous spin-offs and expansions, and this package puts them all into a single DVD-ROM. This is a compilation of every standalone game and expansion ever released for the IL-2, including:

IL-2 Sturmovik
IL-2 Forgotten Battles
Forgotten Battles Ace Expansion
Pacific Fighters
PE-2 Expansion
Sturmoviks Over Manchuria Expansion
46 Expansion

The original game focused on the Eastern Front with 31 types of Russian, German, and American flyable airplanes. And though its flaw was static campaigns, the flight modeling, combat, and environments were incredibly good. It also didn't hurt that the game looked stunning for its time. The next title, Forgotten Battles, started out as an expansion based around the Russo-Finnish War but ended up as a standalone game with dynamic campaigns and 30 new flyable aircraft. The developers opted to move the setting for Pacific Fighters, which successfully filled the gap left open with the departure of Aces Over The Pacific (Dynamix) and Pacific Air War (MicroProse) years earlier. Once again, the stars of the game were the planes. All the aircraft in this box are lovingly modeled with vast research to ensure historical accuracy. Pacific Fighters is also the game that made a big effort to coax more novice players into the hot seat.

This swan song release of the series seems to be named after the bundled 46 Expansion (whose alternate timeline-based hypothetical scenarios and aircraft make us reminisce fondly about 1990's Secret Weapons Of The Luftwaffe by LucasArts). Sure it's fantastical, but the groundbreaking simulation of the aircraft is on par with any other plane available in this series. And what's not to like about a game that lets you fly a mission to punch Hitler's ticket?

Graphically, the game is no longer bleeding-edge attractive. How quickly the times change. For bleeding-edge graphics, you need go no further than Microsoft Flight Simulator X, but IL-2 holds up well and features playable frame rates and ample detail. The music is average, but the sound effects do exactly what they're supposed to: develop your suspension of disbelief as you pilot more than 300 mostly fascinating planes. The series goes out with a bang with this release whilst laying groundwork for an all-new graphics engine in the upcoming Storm Of War: Battle Of Britain, which is currently in development and previewed in the package.

The icing on this cake is the ridiculously low MSRP on a game that features enough depth to keep you occupied for *years*. For a mere $30, you get a lot of content and one of the best World War II combat flight simulators available for the PC. Sorry, console gamers, IL-2 is the type of gaming which reminds us of the type of variety only available to PC gamers. It feels good. ▲

IL-2 Sturmovik 1946 includes scads of actual planes along with a few "what-if" aircraft based on actual designs that never flew.

RUNAWAY
the dream of the turtle

The Sting Of Adventure *-by Dr. Malaprop*

$49.99 (PC-DVD) • ESRB: (T)een • Focus Home Interactive • www.runaway-thegame.com/runaway2.php

The original Runaway (A Road Adventure), which we reviewed in 2003, was very enjoyable but not brilliant—especially compared to classic LucasArts and Sierra On-Line adventure games or even more recent fare, such as The Longest Journey and Telltale's Sam 'N Max episodes. Therefore it was with some enthusiasm that we installed Runaway 2. After all, the game could only be getting better.

You step into the sandals of Brian "surfer dude" Basco. And though you'll recognize him from the first game, he's undergone the mass market-appeal video game character makeover into one hip guy that just doesn't seem as likeable as the old Brian. Nevertheless, Brian's on vacation in Hawaii with his cute girlfriend Gina Timmons. The two decide to go sightseeing a short island hopper flight away. Things go awry during the cutscene, the lovers separate, and the game begins in earnest. Naturally, Brian's going to find and save his woman. Along the way he and Gina experience one farfetched adventure that involves some zany characters and numerous inventory puzzles.

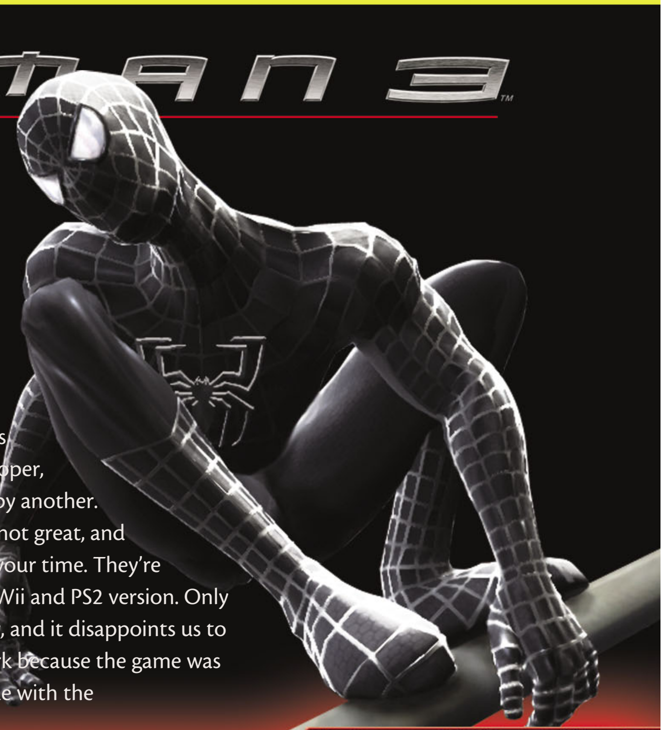
Runaway 2 is exactly how we'd expect a 2D adventure game to look in today's market. The solid visuals include beautiful women, a mad scientist, and all manner of other characters to entertain you. Unfortunately, the pacing and teeny-bopper rhythm of Runaway 2 doesn't quite gel, plus the translation and voice acting of the characters is downright awful. That's a pity because, like its predecessor, Runaway 2 is an enjoyable 2D adventure with mostly logical puzzles and minimum pixel hunt contrivances.

Adventure gaming aficionados will still want to play The Dream Of The Turtle. There's much to like about the title. However, gamers new to the genre would do well to look at Sam 'N Max or The Longest Journey. ▲

SPIDER-MAN 3™

With Great Power… *-by Dr. Malaprop*

$59.99 (360, PS3); $49.99 (Wii); $39.99 (PS2); $29.99 (PC)
ESRB: (T)een • Activision • sm3thegame.com

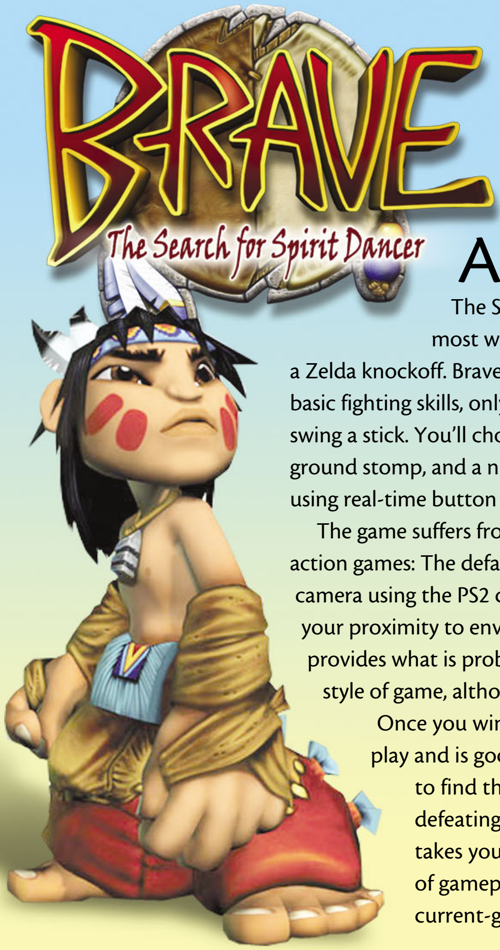


Upon stepping out of the IMAX after seeing Spider-Man 3, it was a straight trip home to try out various versions of Spider-Man 3 games. Thinking back to the unfulfilled sandbox gameplay of Spider-Man 2 made the drive home all the speedier.

The game is light on plot development but includes the villains from the movie, as well as numerous others that any Spider-Man fan will recognize. It keeps the open-world gameplay from Spider-Man 2, which is a good thing, and controlling Spidey through NYC web slinging is as thrilling as ever. It's also great having a game that includes more than 40 missions and 10 different story arches; it's definitely not light on content. (Note to SM3 writer/director Sam Raimi: 10 story arches in a game is good; in a movie, not so good.) Spidey himself in both classic and dark tights looks decent.

However, all is not well in Spider-Man 3 (the game). The PS3 and 360 version lack what we'd call "next-gen" graphics. It looks okay but not remotely close to the games we've been getting used to on the 360 and are expecting from the PS3. During the combat sequences, it feels inappropriate to have your special moves popping up on the screen during the repetitive button-mashing combat.

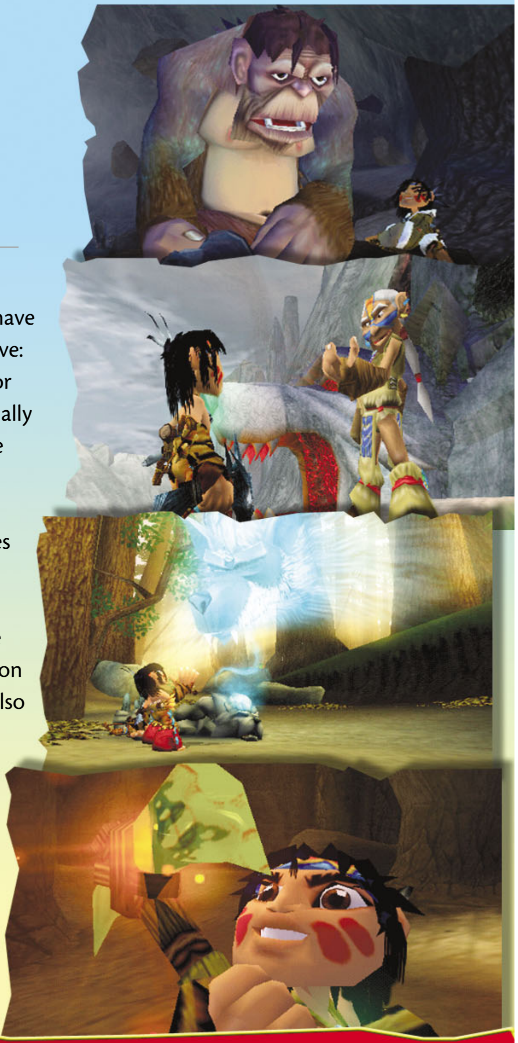
The 360, PS3, and PC versions were created by the same developer, while the Wii and PS2 versions by another. The first three are playable but not great, and there are better ways to spend your time. They're also far better to play than the Wii and PS2 version. Only die-hard Spidey fans need apply, and it disappoints us to see the developers miss the mark because the game was obviously rushed out to coincide with the movie launch. ▲


BRAVE
The Search for Spirit Dancer

Zelda Lite *-by Chris Trumble*

$29.99 (PS2) • ESRB: (E)veryone

SouthPeak Interactive • www.southpeakgames.com



Action/adventure games with light role-playing overtones have been a staple of the PS2's library since its inception, so Brave: The Search For Spirit Dancer is probably very familiar territory for most who own the console. Like many such games, Brave is essentially a Zelda knockoff. Brave is a plucky young adventurer who begins by learning some basic fighting skills, only to be charged with saving his village the moment he can swing a stick. You'll chop down bushes looking for health; have charge attacks, a ground stomp, and a nifty bow and arrows; and take on colorful, cartoony enemies using real-time button presses.

The game suffers from the sort of camera problems that often accompany 3D action games: The default camera view is often less than helpful, and changing the camera using the PS2 controller's right analog stick can be frustrating depending on your proximity to environmental objects and other on-screen items. The game also provides what is probably too much hand-holding for players familiar with this style of game, although you can turn the help feature off if you want to.

Once you win the fight with its camera controls, the game is fun to play and is good for all audiences, as its E rating suggests. Your quest is to find the legendary shaman, Spirit Dancer, and enlist his help in defeating the Wendigo that has enslaved your tribe. The game takes you to some cool environments and provides a nice variety of gameplay elements along the way, all for half the price of current-gen blockbusters. ▲

Wii™

The Nongamers' Console *-by Dr. Malaprop*

$249.99 (Wii console) • ESRB: N/A • Nintendo • www.wii.com • CPU Rating: ●●●

There's no denying the strength of the Nintendo Wii. As we go to press, there's still strong demand for it even though the product was released last fall. We would have reviewed the Wii earlier but had little desire to stand in a line for a console that EA's Chris Heckler described as two Gamecubes duct-taped together during his rant at GDC. But we have one now. So let's get on with it.

Ample coverage of the Wii hardware is easily available on the Web, so we're going to share some usage perspective of today's most popular next-gen console. The console fares well in accessibility to nongamers (including one 75-plus-year-old grandma test subject). It speaks hugely to Nintendo that our anecdotal test demographic had fun playing multiplayer Wii Sports, such as tennis and bowling. There's something to be said for the Wii's waggle controls, but with the exception of a few games, the user controls being ported over for titles seems mostly contrived.

The Wii is a console for gamers who want to get nongaming family/friends to play. Its sexy good looks don't hurt, but your end cost will be higher than touted. And yeah, we *do* get the Wii and what it is trying to accomplish. It's definitely fun, but no amount of design innovation will replace the lack of top-notch controller-centric games for the platform. ▲

XBOX 360 ELITE

The Emperor's New Clothes *-by Dr. Malaprop*

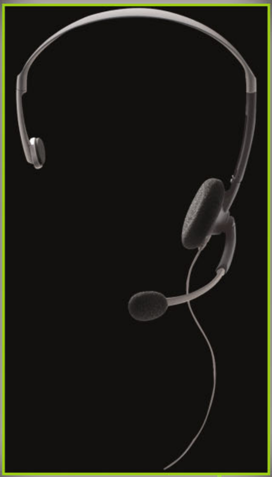
$479.99 (Xbox 360 Elite console) • ESRB: N/A • Microsoft

www.xbox.com/hardware/xbox360elite • CPU Rating: ●●●●●

There's been a lot of talk (maybe too much) about the new Xbox 360, dubbed the Xbox 360 Elite. As you read this, the 360 is coming up on two years in the market, and we've been happy with the improvements that Microsoft continues to make. The most recent Dashboard update supports background downloading, H.264 video playback, and the ability to communicate with friends on the Windows Live Messenger IM client, among other things.

We reviewed the 360 Premium on launch, so here are the key points regarding the Elite. It's highly recommended if you're in the market to buy a new 360 and plan to regularly take advantage of the downloadable Xbox Live Marketplace content. It's also your only choice if your TV only displays 1080p using HDMI. If you believe $399.99 for the Premium is worthwhile, then an extra $80 buys you a cool-looking black 360 with a 120GB hard drive and HDMI (v1.2) video-out. The rest of you, however, would be better off with the overpriced standalone 120GB drive ($179.99). (Search online and you'll find a way to buy and build your own 120GB 360 drive for about $100.) We were disappointed to find the Elite's noise output unchanged. We had expected this media-centric gear to be quieter, and it's not. Rumor is that the CPU/GPU will undergo a die shrink this fall, so if "quiet" is a priority, wait and buy this in a few months. Otherwise, this is pretty much the same 360 that many of us have come to enjoy. ▲

Wireless controller

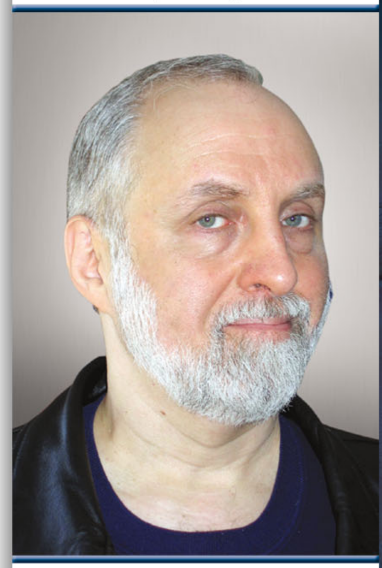


Headphones

Black Xbox 360 console
Black wireless controller
120GB hard drive
Black headset
HDMI AV cable
Component HD AV cable
Ethernet connectivity cable

Machines That Write! Film At 11, Part 2

by Barry Brenesal



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.

In our haste to get this timeline through the Industrial Revolution, let's not forget those ingenious individuals who, along the way, found earlier, simpler methods to automate writing. One, the so-called polygraph, was invented by John Isaac Hawkins in 1803 and produced in the United States by Charles Willson Peale. It copied handwritten letters as they were being written with a mechanism so sensitive that it renders copy detection very difficult to this day. Among the latter's clients was Thomas Jefferson, who used it on tens of thousands of letters in his voluminous correspondence.

Among the latter's clients was Thomas Jefferson, who used it on tens of thousands of letters in his voluminous correspondence.

But the problem associated with this and similar machines is that they copied writing in an era that had recently developed the notion of fastidious penmanship being a sign of good breeding. As the pace of daily life increased, people came to desire speed and clarity in their correspondence, not an indication of moral superiority. It was only a matter of time before typewriters became ubiquitous. "The typewriter has really quite as much individuality as a man's handwriting," proclaims the most famous fictional detective of all, Sherlock Holmes, in the 1891 short story, "A Case Of Identity." Arthur Conan Doyle didn't treat the typewriter as a curiosity because it was already well-known to his urban British audience. But the fact that he used a typewriter as a plot element in 1891 leads me to think it was cutting-edge tech and still a bit of a novelty.

That would change soon. The market was building for typewriters and, predictably, so were the diversity of models and the companies selling them. The Hammond No.1, first produced in 1884, was for its period surprisingly ergonomic (though they certainly didn't describe it as such), thanks to a curved keyboard with keys set in two rows. It didn't neglect customization, either: If you wanted another typeface, you removed the current type shuttle and slotted in another. Then there was the Crandall New Model, introduced in 1886. If the Hammond's keyboard curve was severe, something along the lines of 145 degrees, Crandall's was much gentler at roughly 30 degrees. The curved keyboard didn't last, however. (At least, until Microsoft brought it back recently.) Nor did the Woodstock Electrite of 1925, with its electrified shift keys and typebar. It employed two rheostats to drain the high-powered motor and produced a fair amount of heat as a result. They should have bled that into a hot plate, allowing you to heat coffee while typing away.

Electric typewriters remained a tiny niche market until after WWII, when they gradually began eating away at the manual competition like a bunch of young, eager termites at an international woodworkers' convention. Major improvements began to emerge in the 1960s with the IBM Selectric. IBM introduced the first desktop publishing system, Selectric Composer, in 1966. The Composer required users to type every document twice, the first time to count spaces and measure line lengths and a second time to implement measurements and set line justifications. It wasn't the most pain-free of products to use, but it worked. A year later, IBM began releasing a series of typewriters with magnetic storage devices that allowed you to save, store, edit, and automatically retype previously saved material. These were, in effect, the first word processors, though you still couldn't see editing changes on finished copy in real time.

IBM relished its branding and spent huge sums to further it. I remember attending the 1964 New York World's Fair, where the company had built a pavilion. It looked like a giant, unappetizing mushroom but was intended—at least, to some accounts—as a gigantic representation of a Selectric type element. The seating area was drawn up into it slowly for a multimedia presentation that played like a slick, boring, and criminally long commercial. Ah, youth!

Times changed, but IBM continued to develop the typewriter even after the advent of the PC. The company introduced the Thermotronic line, using thermal transfer to produce high-quality output. But it wasn't cheap, especially easy to use, or capable of developing rapidly to meet the needs of different markets as was the PC. The typewriter was relegated to the status of an antique, aside from a few diehards who clung desperately to their Selectrics and withstood all attempts at physical removal. And no, I'm not one of them. For once. ▲

Wax nostalgic with Barry at barry@cpumag.com

Software Tips & Projects

Discovering New Vistas

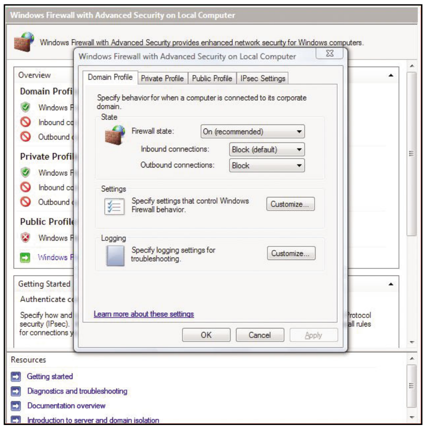
We keep finding ever more tricks and deeper tweaks for Vista. In this episode of our ongoing series of Vista tips, we help you make Vista more your own, giving you more control over the OS' performance and usability.

Super-Sized Security

By default, the Vista firewall has the same failing as previous Windows firewalls: It doesn't block outbound connections in the same comprehensive way most third-party firewalls protect you. Vista actually can block outbound network connections, but the feature is turned off by default. Advanced users can turn it on as well as open a hidden trove of firewall options and insight by typing **Windows Firewall** in the Start Search box. This will open a program called Windows Firewall With Advanced Security. The program lets you see and set rules for how every aspect of the firewall behaves with individual programs. Click around this little-known utility to find a staggering level of detail with which to control your system's security.

For now, let's focus on the most pressing security issue. Highlight the top line of the directory tree in the left pane, Windows Firewall With Advanced Security On Local Computer. The top panel in the center column will show you the Overview of your firewall status, whether it is turned on for the various network profiles, and if inbound and outbound connections are being blocked by default. Click the Windows Firewall Properties link at the bottom of the Overview section. In this next window, highlight the network profile that matches your current connection type (Domain, Private, Public) and change the drop-down setting for Outbound Connections to Block. If you click the Customize button in the Settings section, the next window lets you set the alerts defaults for whether Vista will pop up a warning whenever an unauthorized program tries to reach out to the Internet.

Back at the main window, if you highlight the Outbound Rules branch, you will see all of the programs already registered in the firewall to use outbound ports. You can access the properties of any of the programs and services by right-clicking an entry and clicking Properties. Here you will see deep detail about how the program uses the network connection and toggles for blocking and unblocking that access. Happy hunting.



Windows Firewall with Advanced Security provides enhanced network security for Windows computers.

Specify behavior for when a computer is connected to its corporate domain.

Firewall state: On (recommended)
Inbound connections: Block (default)
Outbound connections: Block

Specify settings that control Windows Firewall behavior.

Specify logging settings for troubleshooting.

Specify how and security (IPsec). for connections y

A well-hidden console in Vista can make your firewall block outbound connections and give you granular control over how every program, device, and service on your PC accesses the network.

Shape Your Search

The search box in the Vista Start menu is a wonderful tool for accessing programs once you get accustomed to typing in a few key letters to bring up common apps such

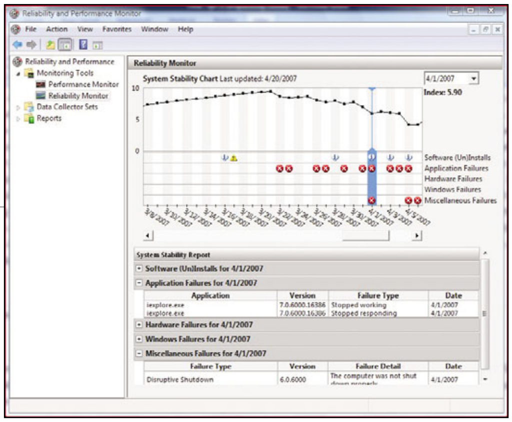
WinXP Tip Of The Month

If you've upgraded to Word 2007, then you know the pain of menu disorientation. The new ribbon interface sends most of us drilling into menus and toolboxes to find familiar commands and settings that used to be close to the surface. One absolutely essential feature of Word 2007, for instance, is wrapping the document text to the current size of your window. Without this critical setting in place, you'll find yourself side scrolling madly when editing a document in anything but full screen. Word 2007 buries this setting. To find it, click the Office Button (icon in upper right) and use the Word Options button in the lower right of the menu. Click the Advanced button in the next window and scroll down to the Show Document Content section. Check Show Text Wrapped Within The Document Window and click OK to activate it. ▲

Registry Tweak Of The Month

If you have a program loading at startup that you can't identify or stop with the usual tweaker's tricks, then use the Registry to hunt down the culprits. There are two places in the Registry that tell Windows to load startup programs. Go to the HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion and look for the subkeys Run and RunOnce. Also go to HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion and look again for Run, RunOnce, RunOnceEx, RunServices, and RunServicesOnce. Deleting the Value will stop the program from loading, but be careful what you delete here. By all means, do *not* delete any of these Run*XX* subkeys. You need them. You can use this Registry entry to locate the files or programs that are being loaded so you can track back whether the program is vital or an uninvited pest. ▲

The Reliability And Performance Monitor maintains a history of Vista failures so you can zero in on recent installations that may have introduced new problems.



System Stability Chart Last updated: 4/20/2007

4/1/2007

Index: 5.90

System Stability Report

Software (Un)Installs for 4/1/2007

Application Failures for 4/1/2007

Application	Version	Failure Type	Date
iexplore.exe	7.0.6000.16386	Stopped working	4/1/2007
iexplore.exe	7.0.6000.16386	Stopped responding	4/1/2007

Hardware Failures for 4/1/2007

Windows Failures for 4/1/2007

Miscellaneous Failures for 4/1/2007

Failure Type	Version	Failure Detail	Date
Disruptive Shutdown	6.0.6000	The computer was not shut down properly	4/1/2007

as Calculator (try "CA") or Word ("WO"). The problem with the Start Search box is that by default it also wastes time searching entire documents, bookmarks, and your email index, as well, even if you use this box only to bring up programs. You can speed up Start Search considerably, however, by limiting its query only to the items you want to access quickly from Start. Right-click Windows' Start button to open its Properties window. Click the Customize button next to the Start Menu item. In the Customize Start Menu window, scroll down to the Search options. Keep the first one, Search, checked, and then select Don't Search For Files, as well as Search Programs and Search All Programs Menu By Name. Also, remember to deselect Search Communications and Search Favorites and History. Click OK to close the windows. From now on, your Start Searches will return only program shortcuts and do so very quickly no matter how cluttered the rest of your system becomes. You can still get full system searches when you use Start Search, however. Simply click the Search All Results link just above the Start Search text box, and a new window pops up that runs the term against the entire index. Remember that you can also filter and speed up this more comprehensive search by opening its Search Tools menu and clicking Search Options. Here you can fine-tune how and where to search in this second search window.

Be Backward-Compatible

Despite Microsoft's testing and assurances, there really are programs that either don't run under Vista or run with an unusual number of hangs and crashes. Don't fret. Windows veterans may recall that most versions come with a Compatibility Mode that lets you simulate the conditions of an older version of Windows for a specific program. To launch a program as if it were running under an earlier version of Windows, right-click the program's EXE file in its program directory (or try right-clicking on the program name in the Start menu) and bring up its Properties menu. Go to the Compatibility tab. You can use the drop-down menus to simulate any major version of Windows back to Windows 95. Use the most recent version on which the program ran successfully. In many cases, this will not be enough, and the old program may misbehave because of the new graphical schemes in Vista. Try checking the boxes for Disable Desktop Composition and Disable Visual Themes and clicking Apply to activate. When you start the app with these settings in place, Vista will kick its interface back into Basic mode, then restore the former Aero state when you exit the program running in compatibility mode.

Some users report problems running older versions of iTunes in Vista. If it gives you trouble, try setting iTunes for WinXP compatibility and check the box for Run This Program As An Administrator. Recent iTunes upgrades are designed to fix Vista incompatibilities, but many users prefer older versions of the media library.

Advanced Crash Hunting

Vista comes with a lot of troubleshooting help that we are still discovering. Hands down, our early favorite is the Reliability And Performance Monitor, because you can use this deep record of Vista's activities and hiccups to diagnose problems. In the Start menu, search for "reliab" and the program should float to the top. Advanced tweakers and diagnosticians might want to create a Start menu or Desktop shortcut to this.

In the Reliability And Performance Monitor window, click the Reliability Monitor. You can select any date since you installed the OS to find instances of application failures, Windows failures, hardware problems, and (most importantly) a log of software installs and uninstalls. This last item is the most telling when you are trying to diagnose a rash of system crashes. Look for driver or software installs that might have preceded a pattern of failure to zero in on the culprit.

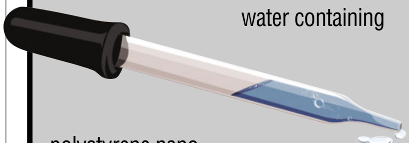
Target Your Volume Settings

Don't let a Windows alert sound crack your eardrums simply because you had the volume set high for your music. In Vista, you can specify volume settings for individual programs and games. Click the Speaker icon in the System Tray and click Open Volume Mixer. The Device column sets overall volume, and the Windows Sounds column controls the volume of your alerts. But any other currently running apps with sound (media players, games, etc.) will have their own volume controls. The Mixer only recognizes and sets volume for programs that are currently running, but we found that it remembers and loads your settings on subsequent launches. ▲

by Steve Smith

Infinite Loop

German Scientist Makes "Micro-tornadoes"



In an attempt to study the meteorological conditions that give birth to tornadoes, Andrei Sommer has created "micro-tornadoes" in a laboratory setting. By evaporating 15-microliter drops of water containing polystyrene nanospheres, Sommer was able to simulate the creation of tiny vortexes that mimic tornado activity. It's probably more effective than driving a Dodge Ram headlong into a twister, but with much less Helen Hunt. ▲

www.sciencedaily.com/upi/index.php?feed=Science&article=UPI-1-20070514-14084000-bc-germany-microtornadoes.xml

Warm Up To Penguins

Let Beryl Cure Your Aero Envy, Part I

Perhaps the most visible change in Windows Vista is the new Aero window interface. With features such as Aero Glass' transparent windows and the new Flip and Flip 3D window-changers, it represents a new look and feel for the Windows world.

Not surprisingly, when Microsoft threw down the gauntlet, the Linux community picked it up and threw it right back. Beryl, a new window manager for X11, takes a number of plays from Aero's book and adds a few of its own. In this two-part series, we'll take a look at what Beryl brings to the table, how to install it, and how to take advantage of its powerful new features.

Beryl doesn't replace your existing GNOME or KDE environment; it sits on top of it. There are so many new features it enables that we could literally spend the entire article just describing them. But some highlights are worth mentioning. Beryl not only gives you the "live" task-changing of Aero but also lets you have multiple desktops placed onto the face of a 3D cube. You can rotate from face to face and even make the cube transparent to see windows on the "other side" of the cube from your current desktop.

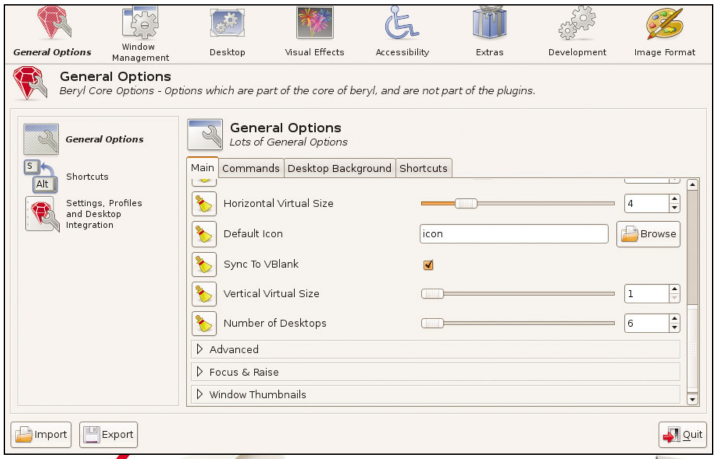
Beryl supports the same kind of transparent windowing that Aero does. It also adds a number of window animations, such as "sucking" the window down into the taskbar, so you know where your window has gone. Beryl can blur the windows behind the current one to make the boundaries of the current window more obvious. And, somewhat bizarrely, you can make windows shake like Jell-O when you drag them around.

One major advantage Beryl has over Aero is that it will run on a lot of systems with older video cards. Beryl's hardware requirements aren't as stringent, so you may find systems that will run Beryl but require a hardware update to handle Aero.

Beryl isn't some flash in the pan: It's become so popular that the most recent release of Ubuntu, Feisty Fawn, has included Beryl in its base package repository, meaning it can be installed with a single command—apt-get install beryl. It is also in the Fedora Core 6 "extras" repository, which makes it equally simple to install (yum install beryl). Even for distributions that don't have Beryl in their native repositories yet, installing it may only involve a couple of extra commands as root. You can find detailed installation instructions for almost any distribution you can think of at wiki.beryl-project.org/wiki/Main_Page.

Installing Beryl may be simple, but getting it to run well on your hardware is going to be the same OpenGL driver battle that plagues all high-end Linux graphics applications. As shipped in distros, OpenGL uses a generic OpenGL software-based renderer, which is turtle slow. In order to get the performance you need to make applications like Beryl work, you need to upgrade to a vendor-proprietary version. Because they are closed-source, non-GPL-licensed software, they aren't included in most Linux distros. You have to download them from the vendor's Web site or add an additional package repository to your package manager and install a new package that includes the drivers.

Getting OpenGL to work on either Nvidia's, AMD's, or Intel's graphics accelerators depends on which distribution you're running. Thankfully, the same Wiki pages that spell out how to install Beryl on each distribution also include detailed instructions on how to turn on high-performance OpenGL graphics. Again, the Feisty Fawn distribution of Ubuntu has done a good job of taking the pain out of this; it had everything installed correctly on our laptop, which used an

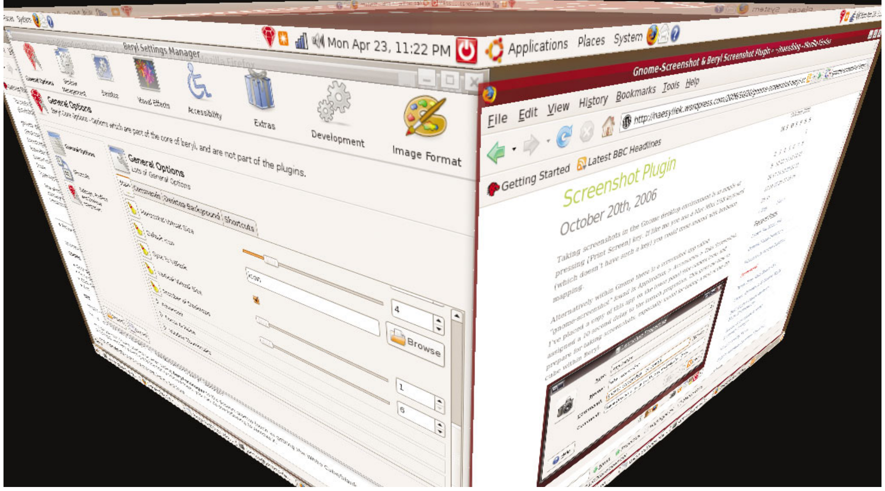


General Options
Beryl Core Options - Options which are part of the core of beryl, and are not part of the plugins.

General Options
Lots of General Options

Horizontal Virtual Size 4
Default Icon icon
Sync To VBlank ☑
Vertical Virtual Size 1
Number of Desktops 6

Beryl has a generous number of options to customize your window management experience.



The Desktop Cube is six sides of multiwindowed goodness.

Intel graphics accelerator. You can obtain Nvidia or AMD drivers from Ubuntu's default repository with a simple "apt-get."

A quick way to check if you have the right driver installed already is to open a Terminal window and type **glxinfo**. You'll receive a ton of information, but if you see a line that reads "direct rendering: No," you're running the slow, generic software version of OpenGL.

Once you've resolved that issue, you're ready to try Beryl. Once you're sure it's working correctly, you can set it to run as part of your default window manager, but for the moment, let's start it manually. Start up your normal X session—GNOME or KDE. Once the desktop is open, open up a terminal window and type **beryl-manager**.

At first glance, things might not look too different. The screen should refresh, and a red gem should appear either in the upper- or lower-right corner, depending on the window manager you're using, but that's about all. But look more closely. If any of your windows overlap, you'll notice that the title bar of the top window is letting the window below it bleed through. Now, double-click the title bar and watch it roll up. Double-click it again and try moving the window. It should jiggle as it moves, like it was made of Jell-O.

Before we move on, let's make something happen on the screen. Start up Firefox and run a Flash animation or game that will run for a while. Now press ALT-TAB (or the change application hotkey) and hold TAB. You'll see a "live" application switcher: You can see the content changing as you look at the snapshot in the changer. Alternatively, slide your mouse pointer to the upper-right corner, and you'll get a gallery view of your running applications. If you minimize a window, a snapshot appears when you hold the mouse over the minimized icon. You may also notice the cool default animations when minimizing and maximizing windows.

We'll look at most of the settings for Beryl in the second part of this series, but let's change two values now so that you can see a few of Beryl's neater features. Right-click the red gem icon and select Beryl Settings Manager. Make sure you've selected the General Options icon on the top and left side of the Settings Manager. Click the Main tab and scroll down until you see Number Of Desktops; set this to 6. Now click the Desktop icon on the top and the Desktop Cube icon on the left. Select the Transparency tab, click Transparent Cube, and close the Settings Manager.

If you press and hold CTRL-ALT and press the Left or Right arrow key, you'll see Beryl switching among desktops. If you look closely, you may even see that it seems to be turning like a cube. To finish out our introduction to Beryl and look at a really impressive feature, make sure that Flash game is still running. Press CTRL-ALT and then click and hold the left mouse button.

Welcome to the Desktop Cube. As you rotate it by moving the mouse, you'll notice that you can see the desktops on the other side of the cube. If you have multiple windows open, you might also notice that it's the bottom, not the top window you see when you look at the desktop from the other side of the cube. You can also see that the flash animation is still running, even as you rotate the cube. Take that, Aero.

This concludes the first part of our look at Beryl. In the final installment, you'll see how to make Beryl start by default when you log in, and we'll take a detailed walk through many more settings. In the meantime, enjoy the cube! ▲

by James Turner

Infinite Loop

What's In An Email Address?

If you're looking for a job, you probably know that you can always use a leg up. As it turns out, a less-than-flattering email address is one of the best ways to shoot yourself in the foot. A recent study among students at Ohio University showed that, other things being equal, job applicants who used unprofessional email addresses were, on the whole, rated lower than those who used more conventional email addresses. For the recent college grad, "budman@yahoo.com" suddenly doesn't sound so attractive. ▲

Source: www.livescience.com/technology/070410_quirky_emails.html

Shavings From The Rumour Mill

by Mike Magee

Chip Invention Is Mother Of Necessity

Questions about AMD's financial future cast a fog over one essential fact: If AMD makes better chips than Intel at competitive prices, it will sell more product. The company already proved that in the last four years, and it can do so again.

It is true that AMD faces a considerable foe in Intel. Intel isn't saddled with debt, it performs better when its back is against the wall, and it can attack AMD's offerings by simply forcing prices down. That hurts Intel, too, but not as much as AMD.

Over the last five months, I've been approached by AMD repeatedly as it touts its Barcelona technology, but the message is being repeated too many times. Until its next chip technology actually appears, the repeated message comes across as hype rather than reality.

In the last three weeks I've been on a journey which I'm calling my x86 World Trip; it started off with me seeing what Via was doing in India, then I spent a week in Beijing at the Intel Developer Forum, while the last part of the jigsaw ended with a few days in Tunisia with AMD. While the x86 World Trip wasn't a jolly jaunt, it was interesting to contrast the different approaches of the three remaining x86 companies.

In last month's column I wrote of the 7-inch screens and convergence UMPC devices Via is proposing. Intel promised something of the same at its Beijing jamboree, but as I suggested in the last column, it's likely Intel will come late to that particular party.

Intel, from the outside, appears to be a revitalised firm. At the Developer Forum it did engage in some hype about future technologies, but it's a very different company now than it was even a year ago. It's more optimistic about the future now that it's gotten over its large-scale layoffs and seems confident that it can deliver on the notebook and desktop products it's promoting. Intel also talked a little about its own Larrabee graphics offering, the big question being whether, after making previous unsuccessful forays into discrete graphics chips, it can successfully compete with AMD/ATI and Nvidia.

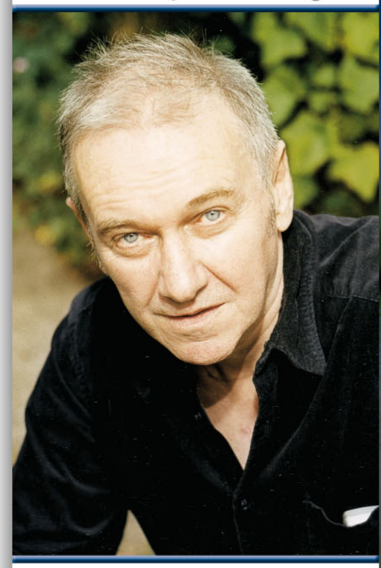
AMD, which is still digesting its ATI acquisition, had some interesting things to say about how it will cooperate with formerly bitter rivals Intel and Nvidia. It will seek to go to market with both Nvidia and Intel as partners for some of its products and will offer cooperative marketing money sweeteners to online and offline stores which choose to sell its products. It's an intriguing approach because of course it depends on Intel and Nvidia playing ball. Will their instincts to push their own products overcome AMD's attempt to woo them with additional sales? We suspect that will be the case.

In the little conversations you have with executives at these events, one question arose continually. Just how is Nvidia going to compete with Intel and AMD if it doesn't have the x86 technology the others have? We know that Nvidia has approached several companies with rights to x86 technology, but it still remains to be seen whether the GPU maker can form a relationship and give its competitors a run for their money.

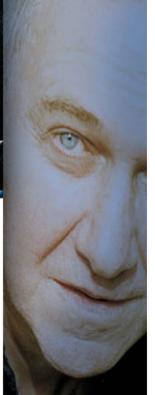
The journalists were once more treated to information about AMD's Barcelona, but we skipped that one because just a week before we'd listened to a senior AMD guy as he attempted to walk us through a 67-page PowerPoint presentation.

We do really hope that AMD continues to come out with products that have the sheer performance and pizzazz to persuade people to buy them without being larded around with PR puff words that convince no one. The arrival of AMD chips that crackled with performance was enough to convince the big PC vendors that they needed these processors, and customers were convinced, too. We all need Intel, Via, AMD, and Nvidia to compete vigorously with each other rather than wage unnecessary wars on the sidelines that get in the way of the necessity for invention.

The persistent questions about AMD's financial situation don't mean the firm will go away. Whether it carries on alone or is absorbed by another firm, AMD-style technology will continue, there's no doubt about that. ▲



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.



Just how is Nvidia going to compete with Intel and AMD if it doesn't have the x86 technology the others have?

Send rumours to "Mad Mike" Magee at mike@cpumag.com.

Wagging The Dog

by Rahul Sood

What Happened To The Lean, Mean AMD Of Yore?

"All warfare is based on deception. Hence, when able to attack, we must seem unable; when using our forces, we must seem inactive. Hold out baits to entice the enemy. Feign disorder, and crush him."
–Sun Tzu, "The Art of War"

I can't tell you how many times I wrote great things about AMD and its meaningful execution over the last few years. The company was doing so well; it cracked into the mainstream, acquired ATI, landed some huge deals, and even caused Intel to fundamentally change for the better. Things were great for AMD, but that was only the first round—there are 11 more to go—and Intel is currently wailing on AMD like Mike Tyson did to that pizza guy.

Not only did AMD lose the performance crown, but it also made a few missteps since it "supped with the devil." The chipmaker allegedly alienated its channel customers, arguably its most profitable segment. It was unable to meet the additional volumes required to support another major OEM, it was late buying ATI, and it sparked a price war that ultimately killed its margins. Such missteps have even AMD's staunchest fans in a tizzy (except for that guy who writes the "Journal of Pervasive 64-bit Computing" blog; what on earth is *he* smoking?).

Even I was worried when I heard AMD had to go for more financing, so I made some calls all the way to the top. I have spoken with key people on the inside who (thankfully) recognize the problems and are working hard to change the company. The bottom line is AMD recognizes the need to change the way it does business—very much like Intel did in the last couple of years.

AMD must now leverage large volume in new ways, streamline its sales teams, and change the way it innovates. The company should no longer be laser-focused on chips; it needs to start delivering easy-to-configure, easy-to-understand platform solutions, platforms that actually make sense to the end user. AMD should also save the marketing doubletalk for another industry; in press briefings for Barcelona in April, the company was still harping on Intel's use of FSB technology—despite the fact that Intel's FSB-equipped CPUs were taking AMD chips to the woodshed! The company needs to start building great products again and focus its message on what they can do, not on their competitor's shortcomings.

AMD also needs to recognize that Intel does not have its legs yet! Intel has so much more room for improvement it's scary, and even scarier is the fact that Intel recognizes that more improvements are needed.

Onward and upward, I always say, and the R600 is the next major product in the newly formed AMD+ATI merger. The R600 is the card that will go down in history as the one with the most screwed up launch schedule since the R520. I can't tell you how many times I heard we were receiving samples and never did, it became something of a joke internally. Although we understand that the integration with AMD has been challenging at times, there is no excuse for such mega-tardiness.

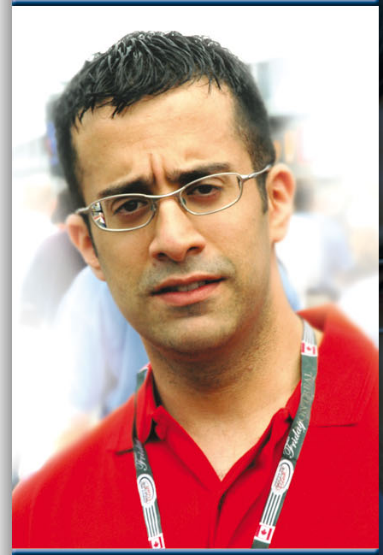
When we finally did receive boards, we were initially disappointed, and I'm sure you've read similar preliminary assessments online. I have to tell you, though, that the R600 is like a fine red wine. It actually gets better with age.

There is no question that AMD's Vista video drivers are excellent, and AMD keeps sending out new versions that increase performance in pretty much every area. The R600 lineup is a very interesting product family, and I think AMD understands what it needs to do to compete with this product; the R600 should do very well for them.

AMD also recently announced its new Phenom CPU family, including the Phenom FX, which boasts four native cores on a single chip. As the marketing suggests, native = better, but like AMD's tired FSB comparison it's meaningless unless we see noticeable performance or incremental value gains.

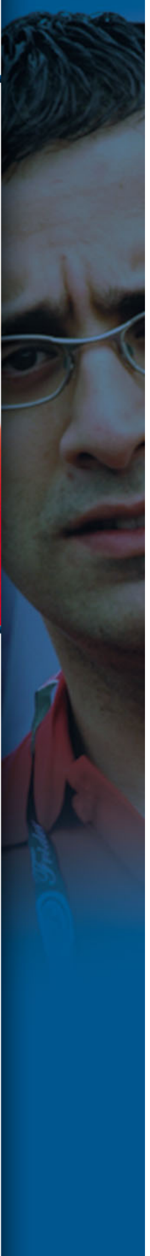
Time to sign off for this month. Until next issue, I wish both AMD and Intel well—good luck, folks, and keep innovating! ▲

Send your opinions to this opinionated guy at rahul@cpumag.com.



Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple //c and painted it red before turning it on. His parents' dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

Things were great for AMD, but that was only the first round—there are 11 more to go—and Intel is currently wailing on AMD like Mike Tyson did to that pizza guy.



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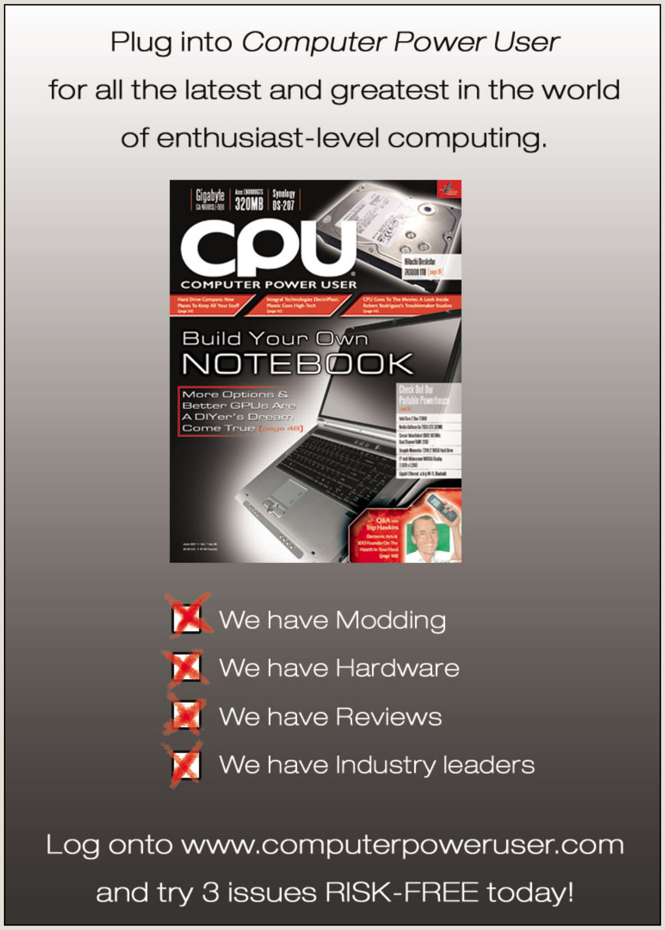

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Technically Speaking

An Interview With David Hamel, Owner Of Boxer Software

David Hamel is owner and senior developer at Boxer Software (www.boxersoftware.com), publishers of a line of text-editing and productivity tools for Windows. The best known of these, Boxer Text Editor, has been around in one form or another since 1991, making Hamel a veteran among independent PC software developers.

by Barry Brenesal

CPU: We all know the obvious differences between DOS and Windows. But as a coder, what are the primary differences that you have noticed in your experience programming for both platforms over a long period of time?

Hamel: One of the things I think was nice about Windows was that it brought a consistent user interface. Back in the DOS days, everybody had their own idea about how things were going to be done. When Windows came along, there were actually books of standards, and Microsoft set the stage by showing us through its common applications how things should be done.

On a more technical level, as a programmer, I was relieved of worrying about drivers, how we talk to every single device in the world. I can remember back when I was doing the DOS version of Boxer. I actually had to have printer code files that equated bolding and similar commands for various printers. Of course, I could only support the most common ones, but that all went away with Windows. Now those things were handled at the operating system level, where they should have been. I didn't have to worry about how a printer printed boldface anymore. It just happened.

CPU: You've updated Boxer through a range of Microsoft upgrades to its GUI, later its platform: Windows 3.0 and 3.1, 95, 98, 2000, XP, and Vista. How have those changes affected you both as an end user and as a developer?

Hamel: I actually sat out 16-bit Windows. I was just speaking with my son, sort of doing a little history lesson, and reminiscing to him that in the very early days, it wasn't altogether obvious that Windows 3.1 was going to become the dominant graphical interface. The Macintosh back then looked really good. Some people say it still does. There was the Lisa, the NeXT, GEM, DESQview; so there were competitors. Coming up from a command line and having a little bit of a Unix background, there was a temptation on my part to say, "You know, this may not fly."

So I never had a 16-bit version of any of my products. I stretched the DOS versions, kept them as current as I could by doing things such as recognizing the Windows Clipboard from a DOS program and including long file name support. Then I jumped up to a 32-bit version, and there were some nice side effects that came about as a result. Thankfully, though, going through Win95/98/NT/2000, etc., there haven't been too many surprises as long as you were a well-behaved programmer you wrote to the Windows API. Once in a while I got some oddball things, but by and large, Microsoft has done a good job of making sure that people who obeyed the rules of the API aren't surprised.

CPU: In those DOS days, we were stuck with a 640K ceiling. Some programmers found ingenious ways around it, and you did, too.

Hamel: Eventually there were many people looking for clever ways to break the 640K memory barrier, which was quite a big thing at the time. The way I got around that was through Boxer TKO; it was much appreciated and turned into a really well-selling product for me. It used the far left DOS extenders, so as a programmer, I could see the address space as a continuous block of memory. That let me insulate myself from the cleverness that was going on behind the scenes. When I wrote my Boxer DOS program, I was very rigorous about writing as though the memory might someday just appear. In other words, I pretended that there was a much higher ceiling than was the case. It was a tough thing to do—something that a lot of developers didn't do—because it certainly wasn't true at the time. There was a very low ceiling. But I disciplined myself to not think in that way and took steps to pretend that more memory might become available.

For example, I used a doubly linked list structure for the way data is stored in the main editor. It relieved me from having any maximum number of lines. So when the far left DOS extender came along and memory just opened up, I was well-positioned to use it. Extending Boxer DOS into TKO worked out very well for me and gave people plenty of memory for large file editing.

CPU: That was prescient of you.

Hamel: I don't know how much was prescience and how much was just programming discipline. I'm a very careful coder and document my code meticulously, even though I'm typically the only one who sees it.

"You know, this may not fly."
—David Hamel

CPU: You supported OS/2 for a while, didn't you?

Hamel: That's right. I did an OS/2 version of Boxer. It was a character mode OS/2 version, before they came out with Presentation Manager. Again, because I'd had the wisdom to put the program in the BIOS layer [the layer that communicates with the machine] in DOS. When I created my OS/2 version, all I had to do to make the program compatible was replace that layer with one that communicated directly with the machine at the OS/2 level. It wasn't too difficult a port for me—about 40 or 50 hours of work.

CPU: Boxer first appeared back in 1991. Since then, you've seen a lot of changes in the PC-based software market. What are the differences between competing in the marketplace then and today?

Hamel: It was much more of a hobbyist market. People who used computers weren't doing so because it was the thing to do; they did it because it was where their hearts were and the way their minds worked. Nowadays, everybody has a computer. Everybody's on the Internet. It's a big part of our society. But back then, it was a devoted core of hobbyists that ruled the day. I would say that the average level of computer savviness was higher back then.

CPU: Has this change in the typical computer user had an impact on your sales?

Hamel: I think overall it has, but I think I've been fairly lucky. I've always had a fairly intelligent user base. I never seem to get those "How do I type ENTER?" questions that some people are plagued with. Now, that may be a curse and a blessing, because it also means my market may be relatively small.

CPU: Did you study computer science in college?

Hamel: I started studying mechanical engineering in college. Then the personal computer bug bit me. I bought a machine, and that really convinced me I should change my major to computer science.

CPU: You mentioned having a "regular job" which you gave up to work full-time on Boxer. What was that?

Hamel: At that time I was a consultant. I went to school in Buffalo, N.Y. Then I settled outside the 128 Boston area, in southern New Hampshire. I had a couple of clients in area. But at the time, I was moving between different consulting jobs, so I was already one foot in the door, one foot out. At that point, it was easier for me to leave for Boxer. I wasn't giving up a 9 to 5 job, so to speak.

CPU: You've stated it was a one-person operation at its inception. Is it still just you?

Hamel: Yes, I'd have to say so. I get some help occasionally, but it's a one-man operation.

CPU: Has the appearance and eventual dominance of the Web affected your business model?

Hamel: Not too much. The business model has always involved putting evaluation copies into the hands of users. And if I do my job right, they'll like what they see and they'll buy. In the early days, that meant getting disks out to users groups, which maintained diskette libraries. From there it moved to disk vendors, companies that published catalogs, where people could buy the evaluation disks at low cost. Shortly after that, it moved to the BBS, then the natural progression was to the Internet. Although the medium by which people got their evaluation copies has changed over the years, the idea that you're trying to put something in their hands that will close the sale remains basically the same.

CPU: If you were asked to give a piece of advice to kids who are considering software programming as a career today, what would it be?

Hamel: Don't go out right away and hire employees and get office space. There are going to be some lean times until you build up your business and you're really sure that it's going to take off. You'll be happier perhaps if you work out of home, doing things on the kitchen table, and keep your expenses low.

CPU ONLINE
Subscribers can read bonus content with David Hamel at
www.cpumag.com/cpujul07/hamel

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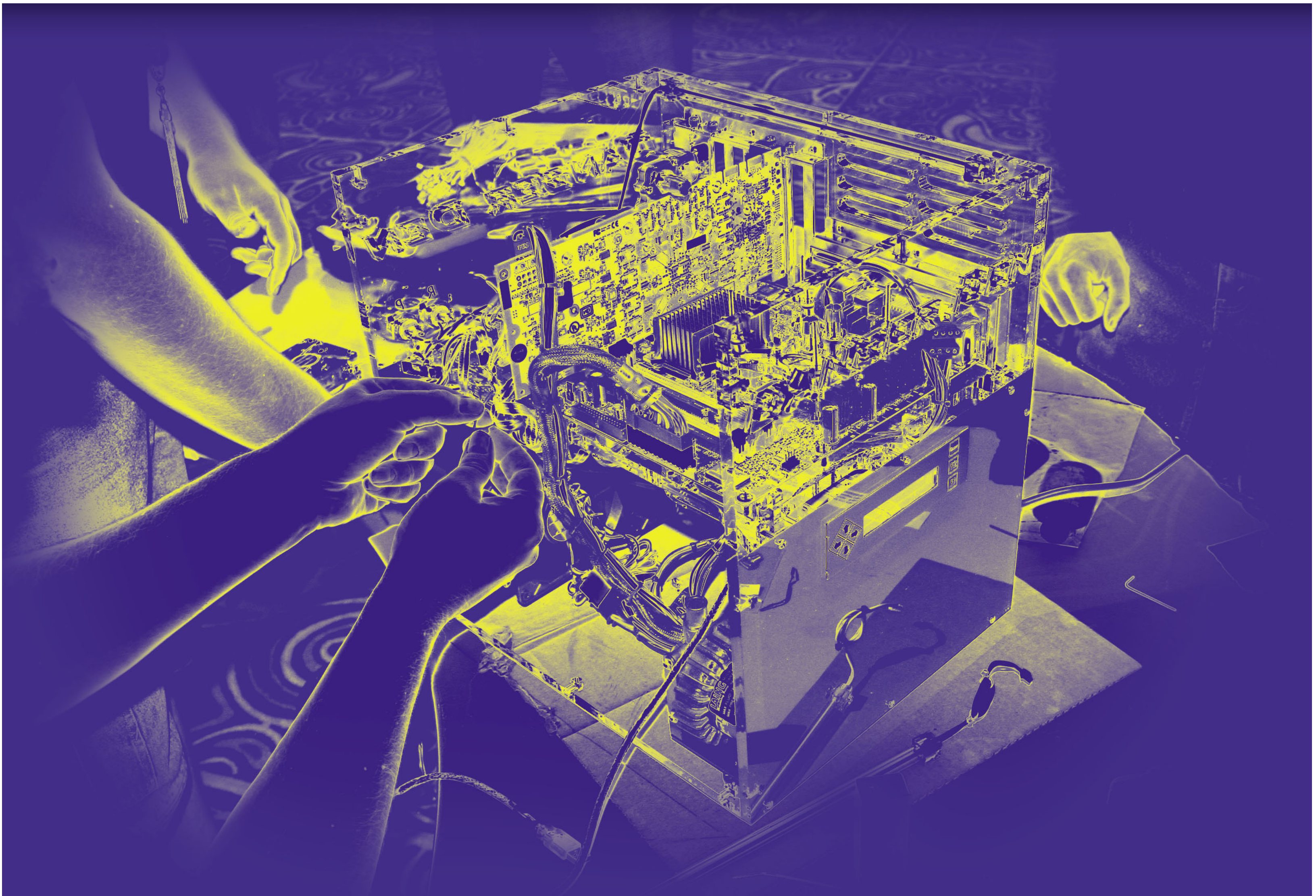

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by Kristina Spencer

Under Development

A Peek At What's Brewing In The Laboratory

These Holograms Are No Illusion

For "Star Trek" fans, the holodeck is the holy grail of sci-fi technology, re-creating reality so accurately that simulated people and objects are not simply a visual holographic representation but also have tangible, physical presence. Its occupants can pick things up, talk to and shake hands with beings they encounter, and climb to the top of what looks and feels like a real mountain.

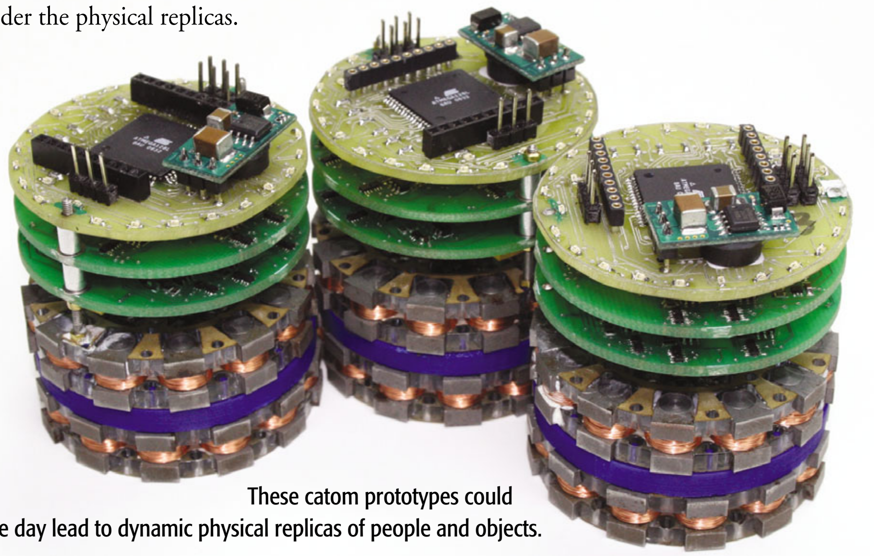
Although scientists haven't come close to that level of creating a virtual playworld (bothersome issues like the law of conservation of matter will need to be addressed first), researchers at Intel and Carnegie Mellon University *have* made progress in creating what might best be described as 3D physical holograms—replicas of people and objects that have a physical presence and the ability to move and interact just as their real-world counterparts would.

The research is called claytronics, or dynamic physical rendering, and the hardware building blocks of these future objects are claytronics atoms, or "catoms." The catoms will have the following four capabilities: computation, motion, power, and communication. Just as it takes billions of cells to make up each object in the physical world, billions of catoms will be required to render the physical replicas.

The team has built large catom prototypes, about 2 inches across, but the hardware will need to become much smaller to accomplish its vision. An even bigger research challenge is that claytronics requires very powerful software to first capture 3D data about objects and then program, quickly configure, and reconfigure the catoms into various shapes.

Jason Campbell, one of the project researchers at Intel, says that the goal is to allow this morphing process to happen in real time. "Initially, it might take some time because the actuators may not allow the catoms to move very fast, and our control algorithms may be too immature. But we eventually hope that an ensemble could reconfigure itself quickly enough to simulate a human being speaking and gesturing."

How far away is this remarkable technology? "I believe that with a reasonable investment, real application prototypes will be available within five years," says Seth Goldstein, associate professor at Carnegie Mellon and one of the inventors of claytronics. One of the first applications he foresees is a 3D fax machine, which would work like a traditional fax machine, except the result would be a replica of a stationary object. ▲



Credit: Carnegie Mellon University

These catom prototypes could one day lead to dynamic physical replicas of people and objects.

Point, Snap & Search

In theory, having an Internet-enabled cell phone opens up a world of information access on the go. For example, if you're trying to decide which movie to rent at the video store, you can quickly open a browser and search for reviews to help you decide. In reality, typing in search keywords can be a frustrating and time-consuming experience, especially if the words you're typing are long or difficult to spell.

What if, in this scenario, you could take a snapshot of the DVD cover with your phone's camera and have reviews for your browsing pleasure within 10 seconds? That is the idea behind Lincoln, a Microsoft Research (research.microsoft.com) prototype that aims to help users find information on the Web using image-based rather than text-based searching.

The software uploads a snapshot from a mobile phone to a central database and attempts to match it with tagged photos that are linked to pieces of information. When the software makes a match, the associated information is served to the user. In order to complete the search quickly and make the system scalable as the database grows, the search engine uses an algorithm to create a signature for each image based on a triplet of data points. The engine then compares the signatures to make at a match, a quicker process than comparing whole images.

According to Larry Zitnick, lead researcher on the Lincoln project, the system is fairly tolerant of focus and motion blur encountered when taking snapshots.

The software is free for users to download and works on smartphones running Windows Mobile 5. Zitnick hopes that users will start uploading their own images to augment the database. He adds, "I'm also working on increasing the sets of objects that Lincoln can reliably recognize, such as locations and objects with shiny surfaces." ▲

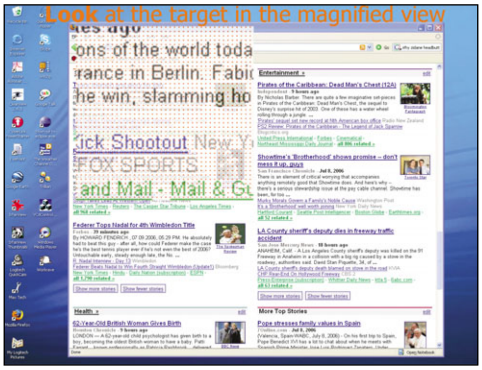
New Interface Lets Your Gaze Be Your GUIDe

When you're navigating through information on your computer screen, using a mouse to point and click is king. Trackballs and trackpads are variations on the theme that work better for some, and touchscreens have found their place on kiosks and handhelds. But for everyday use, there hasn't been a new interface option compelling or cost-effective enough to oust the mouse/keyboard combo.

Manu Kumar would like to change that. As the principal researcher on Stanford's Human-Computer Interaction group's GUIDe (Gaze-enhanced UI Design) project, Kumar has created a series of applications that use eye-tracking to accomplish tasks such as selecting links and paging up and down through on-screen text.

Although eye-tracking as a navigational method isn't new (some interfaces for disabled users use a combination of gaze and blinking for hands-free clicking), Kumar's approach is different because it doesn't take touch completely out of the equation. Instead, the system enables a user to target a particular part of the screen with his gaze, then press and hold a hotkey to magnify that area and further zero in on the link. When the user releases the key, the link is selected. The entire process takes less than a second.

The GUIDe project currently includes five applications: EyePoint, which lets a user point and select links; EyeExposé, an application switcher; EyeScroll, which automatically moves to the next screen of text when a user reaches the bottom of the current page; EyePassword, which allows visual PIN or password entry; and EyeSaver, which is a screensaver that toggles the screen off and on when a user looks away and then looks back, respectively.



Using a combination of gaze tracking technology and hotkeys, the GUIDe project presents a new method of computer navigation.

The applications require new users to go through a one-time, 20- to 30-second calibration process that enables the program to respond appropriately to the speed of the users' eye movement. Users also require a special screen containing a high-resolution camera and infrared lights to track eye movement.

The cost of the required hardware, around $25,000 for the system Kumar and his fellow researchers use, is one major impediment to potential consumer adoption of the new interface. "If a low-cost eye tracker were available, the software and interaction techniques we have developed can be used immediately," says Kumar, "but it will likely take two to five years for the cost issues to be mitigated."

Another hurdle that the team is working to overcome is an unacceptably high 20% error rate. They've recently published a paper showing that this rate can be greatly reduced with a new technique they've developed and will soon be implementing it in a new version of the EyePoint application. ▲

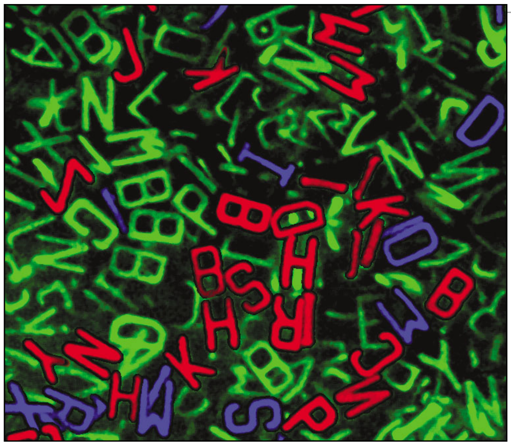
Letters, We've Got Letters

Researchers from UCLA have created a soup—not of the primordial variety but one with a more literary flavor—filled with microscopic, fluorescent plastic particles in the shapes of all the letters of the alphabet. But like its primordial cousin, this liquid could one day lead to the development of new devices, assembled from the particles and functioning on the microscale.

The significance of the team's production of the so-called "LithoParticles" lies in their ability to be mass-produced with precise design and a remarkable level of uniformity. These two qualities are building blocks that could fit together to create potentially complex nanoscale objects such as pumps or engines.

In fact, Dr. Thomas G. Mason, the study's co-author and associate professor of chemistry at UCLA, says that the next step in the team's research involves finding ways to put together differently shaped pieces in order to start building more complex structures. And because they can be moved with "laser tweezers," the particles could potentially be attached to or placed inside individual cells to market them for medical and/or research purposes.

Mason is optimistic that the team's research will produce real-world applications sooner rather than later. "I think that one to two years for the appearance of products, such as biomarkers, is ambitious but realistic." ▲



UCLA researchers have designed and mass-produced billions of fluorescent microscale particles in the shapes of all 26 letters of the alphabet in a "colloidal alphabet soup."

Credit: Carlos J. Hernandez/Thomas G. Mason, UCLA Chemistry

Q&A With Dave Orton

Dave Orton is the mild-mannered executive vice president of the visual and media businesses at Advanced Micro Devices. Last year, he agreed to sell his graphics chip powerhouse, ATI Technologies, to Advanced Micro Devices for $5.4 billion. Now he is helping spearhead the joint strategy of the graphics and microprocessor divisions, including leading the creation of the Fusion architecture, which combines a microprocessor and graphics on a single chip. Orton joined ATI in 2000 with the acquisition of ArtX. He became CEO of ATI in June, 2004. He talked with CPU about the ambitions of the combined ATI-AMD company.

Q **Why did you decide to merge ATI with Advanced Micro Devices?**

DO We announced it in July 2006. It starts with the foundation that both ATI and AMD believe the PC market is heading in a direction that is really going to drive a level of integration. The second opportunity is that in the consumer electronics market and the PC market, there will be a great opportunity to drive the convergence between the two. When we look at the combination of where the PC market is going, where it will intersect with the consumer electronics market, we got excited about how we could participate better in those two markets. And at the same time, we wanted to innovate at a high rate. We were approached by AMD. The opportunity to innovate focused on new customers and new markets. That is what drove us together.

Q **What is the context as far as competing with Intel and how that influences a counter strategy to what Intel does?**

DO There are two components here. ATI has worked with Intel for all of the 21 years we were in existence. In the middle of this, we were working with Intel in the chipset business and a range of graphics businesses from Crossfire to next-generation PCI Express. As we go forward, we are the epitome of co-opetition. The reality of this is our chipset focus will drive AMD platforms into the market. Then we'll move downstream and integrate graphics products and other IP cores into emerging markets and high-growth markets. On top of that, we have the GPU market, providing customers with choice in the broader PC market. We know and work with Intel in the broader PC market to bring ATI GPUs to the market.

Q **You have two main options in the marketplace, the high end and the low end. With the low end, it seems Fusion is the answer. Can you describe that?**

DO We see Fusion playing in a range of markets. But I agree with your perspective that one of the first instantiations of this is the low end. The technology business is a better, faster, cheaper business. How do you take a new technology to market? Make it faster and better. But at the same time, we have this constant drive to move down market. The PC market has historically done that. In the late 1990s, integrated graphics came into its own. This is a natural evolution of that. For power, for space reasons, for form factor, and for cost, our goal is to create and drive the accessibility of the PC into new cost points and not compromise on performance and features.

Q **How is the schedule for Fusion looking?**

DO We talked about it as a 2009 initiative. When you talk about silicon development, that's reasonable. The practical side of it is when you bring two architectures together, that is a reasonable time frame for two companies to bring them together. For the mainstream, you think about the form factors of thin and light notebooks and the mobility for the PC market. On the high end you get into this question of general-purpose GPUs. A range of media processing technology. Codecs and the like. There are opportunities at the high end as well to look at the concept of Fusion. In the mainstream of the market, and in the high-end area, we see opportunities as well. In the 50x15 initiative (getting 50% of the population on the Internet by 2015) for developing countries, there are opportunities too. As well as in some of the high-end areas. We see that as well. When you think of the low end, there are new convergence devices. We can take converged devices to emerging markets. We are trying to provide 50% of the world access to the Internet through PC technologies. ▲

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